FLIGHT, MAY 6, 1937

FIRST AERO WEEKLY IN THE WORLD

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MAY 19 1937

FLIGHT

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The AIRCRAFT ENGINEER AND AIRSHIPS

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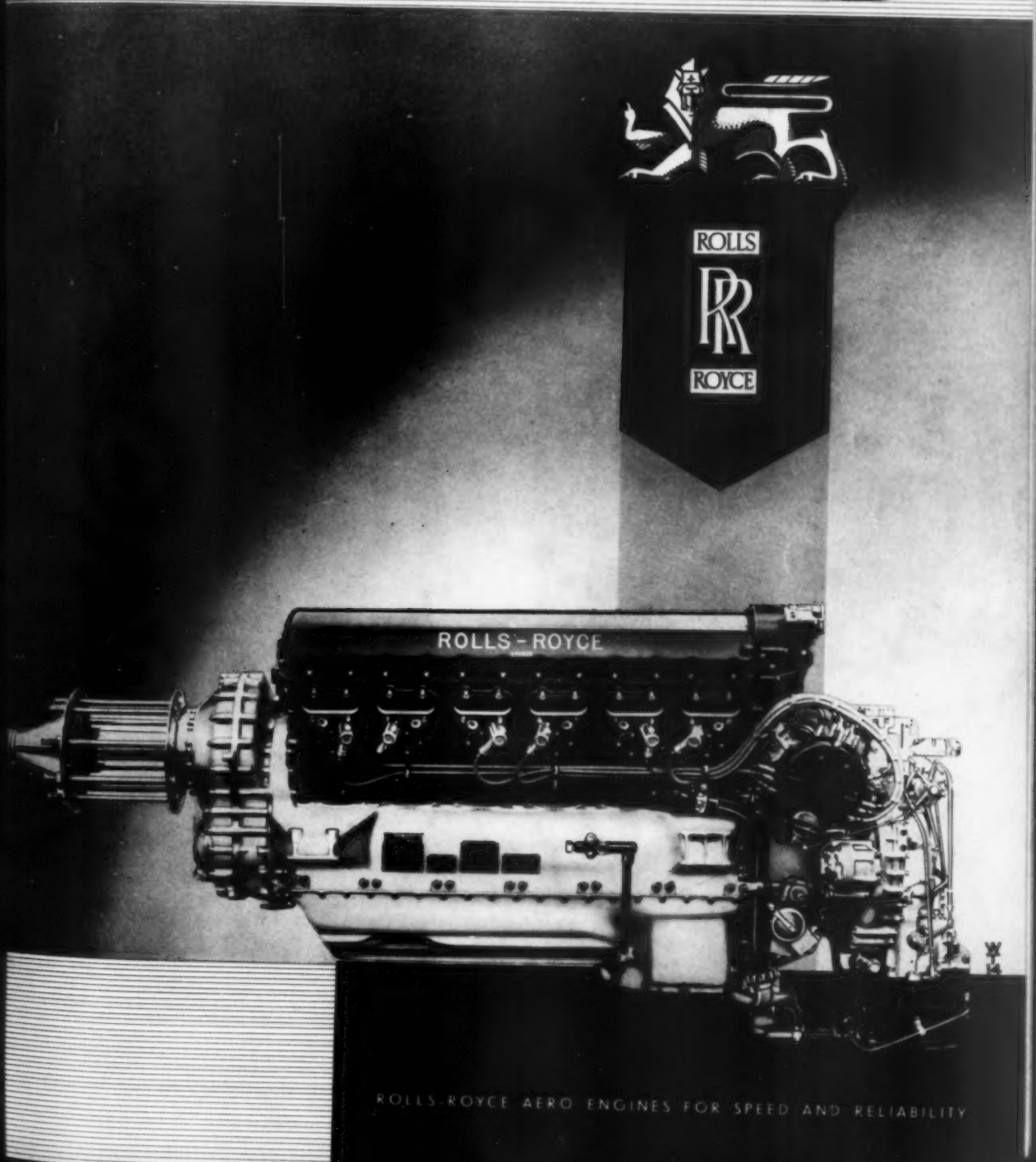

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The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Since the Last Coronation

A PERUSAL of the historical reviews, in this issue of *Flight*, of the progress made in flying since the coronation of His late Majesty King George V in June, 1911, shows that the period covers, to all intents and purposes, the history of *practical* flying. Figures can provide "milestones" along the road of progress, but there remain many aspects which elude evaluation. At the R.A.F. Display at Hendon last summer Mr. R. J. Mitchell, Supermarine's famous designer, was watching the evolutions of some of the ancient aeroplanes which took part in the fly-past and comparing the machines with the very latest types that were also be to seen at Hendon. He put to the Editor of *Flight* the question: "Now, why couldn't we have done all this many years ago? It is all very obvious after all." And certainly it is a little difficult to find a ready answer to that question, at any rate a short answer.

One part of the answer might have taken the form of pointing out that in the early days our knowledge of aerodynamics was somewhat meagre and not too well founded. Even in 1912 we did not know the spin, and when Lieut. Parke, R.N., got his Avro cabin biplane into one over Salisbury Plain during the Military Trials we did not understand the nature of it. Lanchester had foreseen something of the sort, and used to refer to it as "catastrophic instability," although that related to directional instability rather than to the spin.

His Majesty King George VI in Royal Air Force dress uniform. His intimate association with the Service is described on pages 432-433.

Another direction in which there has been vast improvement, not shown by figures, is in the direction of control. In 1911 lateral control was almost universally by warping the wings. This tended rather to encourage the spin, as it increased the angle of incidence a good deal on one side while decreasing it on the other. Modern differentially controlled ailerons are much more effective, not to mention flaps, such as the Frise and Handley Page slotted type. It is, perhaps, open to argument whether the stability of modern aeroplanes is better than that of some of the old types. The B.E. 2C, for instance, was remarkably stable, too much so for extreme manœuvrability.

By far the greatest increase in performance we owe to our engine designers. In 1911 the fourteen-cylinder Gnome

of 100 h.p. was regarded as a tremendous power plant, only to be entrusted to pilots of exceptional skill. The Rolls-Royce " R " engine fitted in the Supermarine S.6B seaplanes of the last Schneider contest developed 2,300 h.p.! Moreover, the reliability of the early engines was very questionable, and periods between overhauls were measured in hours instead of in hundreds of hours.

Structural materials have improved very greatly, but even to-day there is no reason to doubt that a perfectly good single-seater fighter could be built of wood. Although aerodynamics was an art rather than a science in 1911, there is no very obvious reason why it should not have been quite evident that the suppression of all excrescences would reduce drag. In fact, except for the retractable undercarriage, all such protuberances *were* suppressed in a very early French Antoinette monoplane with cantilever wings; and that machine had a " trousered " undercarriage!

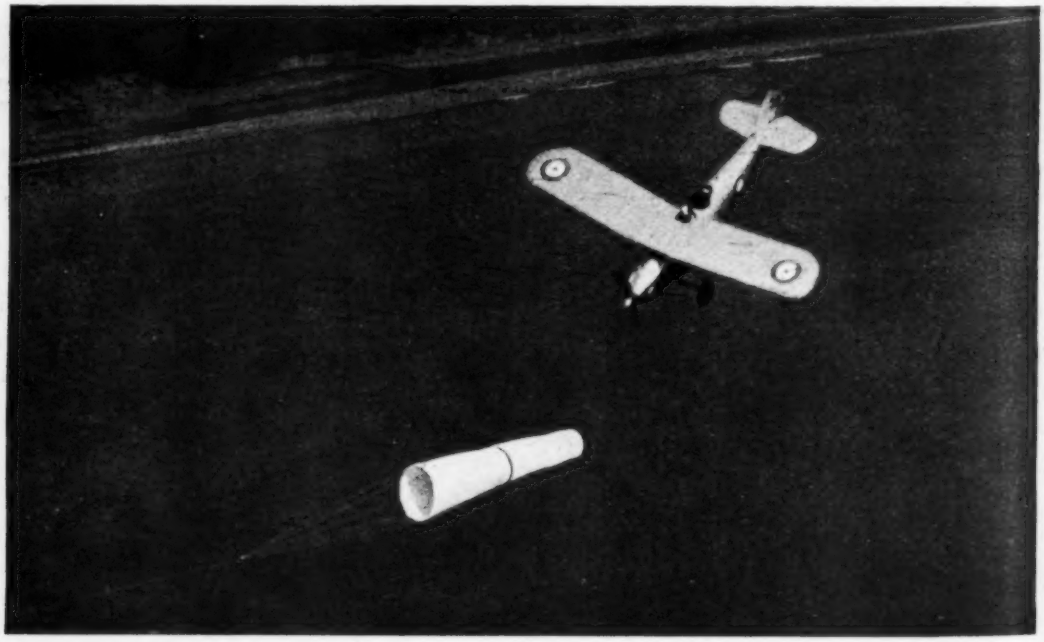
On the aircraft side, therefore, it would seem that, as Mr. Mitchell said, we *could* " have done all this many years ago." But we could not possibly have had the engines. Neither the materials nor the machine tools were available.

A Battleship Bombed

THE controversy about bombs and battleships may, unfortunately, be renewed now that the old Spanish ship *España* is alleged to have been sunk by an air bomb. One theory says that she struck a mine while the bombs were missing her, but that is still uncertain. The most circumstantial account so far to hand says that three bombers, escorted by fighters, attacked in line astern from a low altitude, and that of seven heavy bombs aimed at the stern of the ship two scored hits. One witness from the shore asserted that a bomb fell astern of the ship, and presumably holed her from the outside. Until accurate details are received—if they ever are received—definite conclusions cannot be drawn. There is also doubt as to whether the *España* had on board modern German anti-aircraft guns manned by trained German crews.

Certain reflections, however, do occur to the mind. A heavy bomb dropped from a low altitude can hardly attain its terminal velocity, and its penetrative power should not be great. Even if it fell on an unarmoured deck (and the *España* had a steel deck of only 1½in. of steel over her engine-room and magazines) it would be unlikely to hole the hull below the water-line so as to cause the ship to sink, unless it actually exploded the magazine. The external armour of the ship consisted of 8in. of steel amidships, but only 4in. at the stern. It would therefore seem probable that the fatal bomb (if bomb it was) was a near miss which holed the ship from outside.

The eye-witness mentioned above says that the ship made a swift turn to avoid the bombs, but, if so, the manœuvre certainly came too late. Whether it is true or not that the majority of the officers on board were Italians and the crew mostly Spanish landsmen who showed themselves very unhandy in launching the boats, it would seem a fair conclusion that the ship did not take all the protective action when attacked from the air which would be expected from a ship of the British Navy. On the whole it appears certain that air bombers could hardly have desired an easier target, and it will be surprising if a capital ship (if, indeed, the *España* could fairly be called a capital ship in the modern sense of the word) not caught in harbour but under steam and cleared for action ever again allows air bombers to score such an easy success. The circumstances of this sinking were exceptional, and it would be most illogical to draw general conclusions from an exceptional case. But if a mine caused the sinking, then nothing has been proved.



A WHIFF OF CORDITE : An Audax pilot at front-gun practice on the range at Hell's Mouth, an inlet on the Carnarvonshire coast. The drogue target is towed on a 1,000-ft. wire.

The Outlook

A Running Commentary on Air Topics

Gaiety

PERHAPS there is something auspicious in the transformation of the quondam Gaiety Restaurant into Ariel House, the headquarters of the Civil Aviation Department of the Air Ministry. Some might think that the naming of the house from a character in *The Tempest* was a trifle sinister, but, after all, Ariel's song with its "On the bat's back do I fly" is full of the same joyous spirit which inspires the private pilot. But, as the same house is full of associations dear to wireless fans (was it not once 2LO?), we should not be surprised if sometimes, in moments of aberration, the spelling gets altered into Aerial.

The new organisation, however, is strictly businesslike, and the division of the Department of Civil Aviation into three directorates shows how the civil side of flying has become a matter too great for a small staff to deal with the whole of it. That is a very welcome development. It was not Ariel but Puck who professed his ability to put a girdle round the earth in twenty minutes. Imperial Airways are not yet quite so ambitious, and if Mr. Wimperis is right in putting the limit of air speed at 600 m.p.h., then Puck's record will remain unchallenged. None the less, Imperial Airways do intend to girdle the earth, and if they fly at something less than the maximum possible speed the journey will be all the more enjoyable for the passengers. In any case a great work lies before the new denizens of the old Gaiety, and *Flight* wishes them all success in the coming days.

Better Late Than Never

IN the issue of March 11 last *Flight* commented, under the heading "Tomfoolery," on the French Air Minister's offer of a prize for an air race across the Atlantic. Our point was that such a race could prove nothing, would commemorate nothing (for the idea of holding it on the tenth anniversary of Lindbergh's flight had to be abandoned), and might well cost the lives of more than one crew. It is gratifying, though not surprising, to find that other influential parties have raised similar objections, and that these protests have made a due impression on M. Pierre Cot, the French Air Minister. During his visit to England last week he was interviewed on behalf of *Flight* by Mr. E. J. Hart, with whom M. Cot frankly discussed the position. The following is a *précis* in English of M. Cot's remarks:—

"There is not one word of truth in the suggestion that my Government intends to withdraw its five million francs prize offer. That offer stands—unquestionably. But I do not expect that a race across the Atlantic will take place this autumn. On present indications, I think that it will be postponed until next year. Alternatively, new conditions may be drawn up for another route. With so little meteorological data available, I should feel happier if a land route, of the same length, were substituted. It is not for my Government to impose conditions. We have no power to cancel the race. In an international contest the final decision must rest, naturally, with the aero clubs of the countries concerned. The main objection comes from the National Aeronautic Association at Washington. It has strongly urged the Aero Club de France to postpone the race—for humanitarian reasons. As a practical flying enthusiast, I endorse the American view that aviation would be ill served if the world's ablest pilots were allowed to embark on a venture of which the end is so far from certain. And until our scanty research work on conditions over the North Atlantic is much farther advanced, I agree with the American opinion that it would be reprehensible to endanger the lives of brave pilots.

"Yes, I admit that I should have thought of all that before sponsoring the contest. The offer on behalf of my Government was made in all good faith. I can only say that I regret the impulse that prompted me to make it, before more closely examining the difficulties which have since been raised in America."

Frank confession of impulsiveness to some extent disarms criticism, especially when accompanied by a readiness to take corresponding action. M. Cot says that his Government has no power to cancel an international race, but that it can postpone it if sufficient protests are received from the aero clubs of the countries concerned. Postponement *sine die* would meet this case, and it now only remains for the aero clubs of other countries to follow the example of the National Aeronautic Association of the United States in protesting against the running of unnecessary risks for no sufficient reason.

If all the mishaps which occurred during the Schlesinger race to Johannesburg had taken place in a race across the ocean, the tragedy would have been big enough to have killed all air racing for a generation.

Ocean Airships?

THE resumption of the regular airship services across North and South Atlantic makes the subject of airships topical. The experimental flights across the North Atlantic this summer by heavier-than-air craft will doubtless provide experience for air mail routes of the near future, but the operation of flying boats and landplanes with reasonable pay-loads of passengers is still not in sight, and it would be well not to overlook the claims of the airship.

During the winter months, while she was laid up, the opportunity has been taken to increase the passenger accommodation of the *Hindenburg* by 20 new outside cabins, bringing the total of passengers to 70. The Zeppelin company expects, in the L.Z. 130 nearing completion and the 131 which is to follow, to increase the passenger accommodation to 120 or even more. This begins to look like real commercial trans-oceanic air travel, and it is greatly to be hoped that the negotiations which have been proceeding and are being continued between certain British and German interests will result in a company being established for operating airship services across the North and South Atlantic.

While only two airships are in existence it is obviously difficult to obtain a proper idea of operating costs, because the overhead charges which should properly be borne by each ship are difficult to decide. It is thought that an airship of the *Hindenburg* type can be built for something like £450,000, and that if two or more were ordered at a time this figure could be reduced. Neither hydrogen nor the diesel fuel oil is excessively expensive, so that doubtless there are possibilities of successful economic operation. The technical side may be said to have been proved already by the work of the two present airships.

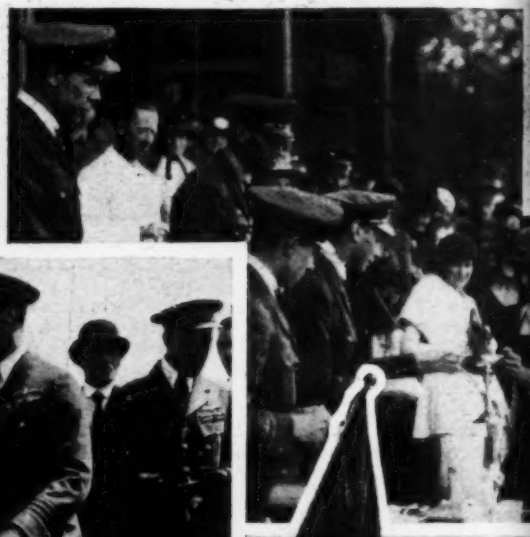
It is interesting to learn from representatives of the Zeppelin company that the Daimler-Benz sixteen-cylinder diesel engines have, since the minor troubles experienced on the first flight, been running very well and are considered entirely satisfactory. *Blaugas* was not used last year, but may be reintroduced for some of the engines.

DIARY OF FORTHCOMING EVENTS—PAGE 446

OUR KING and the AIR

His Majesty's Career as an Officer of the Royal Air Force

1. Flying to Brussels with Her Majesty the Queen (then the Duchess of York) in the Imperial Airways' liner *Draco* in 1935.
2. Chatting with Lord Cowdray at the unveiling of the Royal Air Force Memorial, Victoria Embankment, in 1923.
3. Presenting prizes at a Service sports meeting at Queen's Club, London, in 1919.
4. During a visit to Belgium. His Majesty as a Wing Commander.

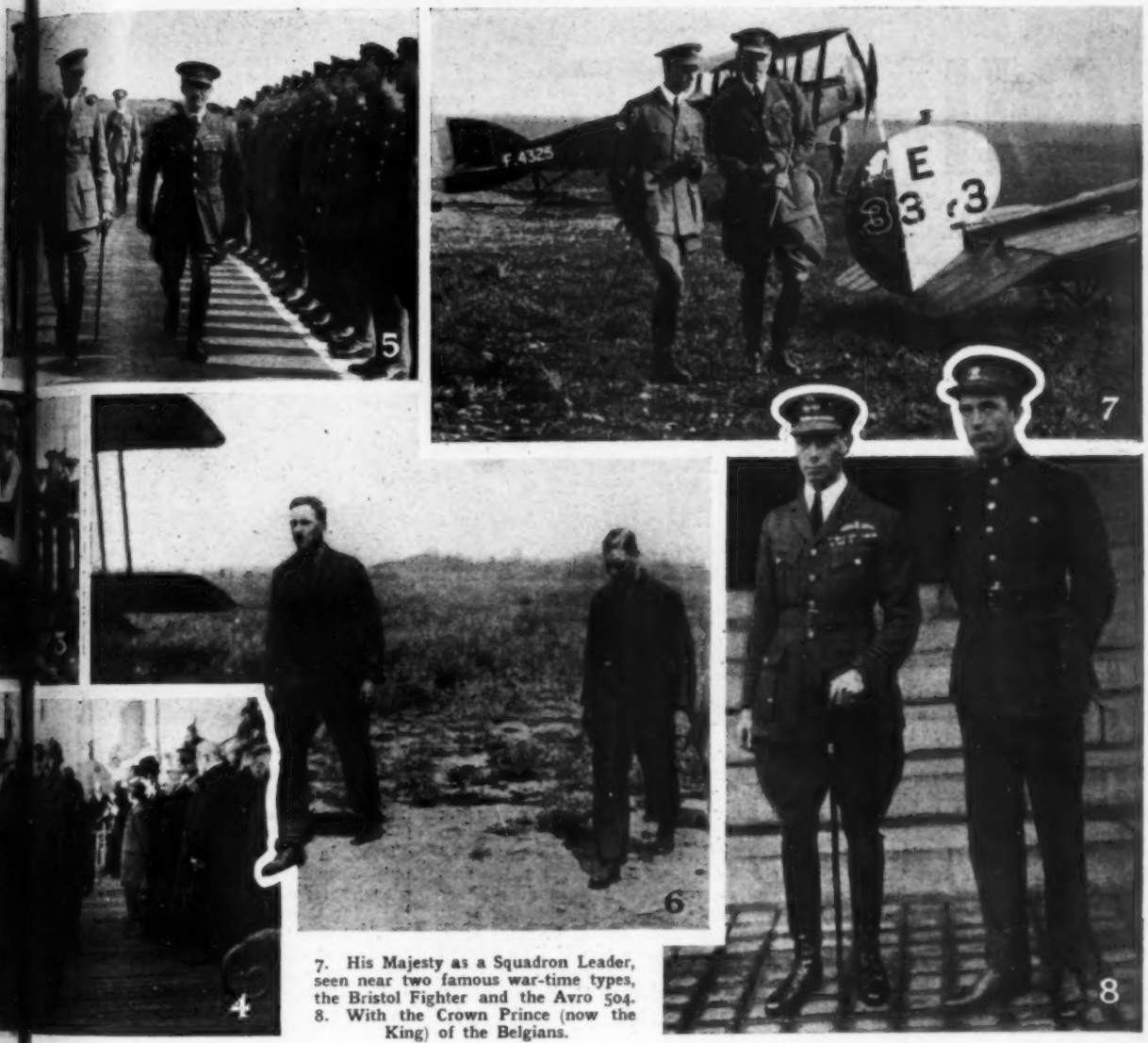


5. Inspecting airmen at Cranwell.
6. An informal snap when the King (as Prince Albert) was learning to fly at Croydon soon after the war.

THE late King Albert of the Belgians was the first crowned head to make regular use of aircraft as a means of travel, if indeed he was not the first monarch to go into the air. King George VI of the British Empire (the diplomatic title of His Britannic Majesty has a fine ring) is the first king who has ever qualified as a pilot and has earned the right to wear the "wings" of his own Air Force. Both King George V and King Edward VIII wore "wings" when they donned the uniform of the Royal Air Force, but that was presumably because the King is always in a special position in relation to his fighting forces. King George VI, however, wears the pilot's badge not *honoris causa*, but because he actually went through a course of flying instruction when, as Prince Albert, he was a serving officer in the Royal Air Force, and was passed out by his instructor. The scene of his instruction was then known as "The Government Aerodrome, Waddon." Now, of course, it is Croydon Airport.

When the Great War broke out there was no Royal Air Force, and only the two eldest of the sons of King George V were old enough to have entered any fighting Service. The then Prince of Wales had just come down from Oxford and received a commission as Second Lieutenant in the Grenadier Guards, but was still untrained in regimental duties. Prince Albert was a midshipman in the Royal Navy. Naturally, they both remained in their respective Services. At that time the pilots of the Royal Flying Corps were all officers seconded from regiments or other corps of the Army, and the Royal Naval Air Service was on similar lines. There was no reason why either of the Royal Princes should consider joining an air arm. The infantry was the most important arm of the Army, and the battleships held a like position in the Navy. So Prince Albert remained in H.M.S. *Collingwood*, and in that ship went through the Battle of Jutland.

At that time the Prince's health was far from good. More than once he had to leave the Grand Fleet and go into hospital, once for an appendicitis operation. Finally, it became clear that he would have to give up his active duties in the Navy. Meanwhile, in April, 1918, the Royal Air Force came into being. The formation of a new fighting Service was an event without precedent since the idea of a regular Army and a regular Navy had been accepted



7. His Majesty as a Squadron Leader, seen near two famous war-time types, the Bristol Fighter and the Avro 504.
8. With the Crown Prince (now the King) of the Belgians.

in the country. In time of war, too, fighting Services hold the first place in popular esteem. It was very desirable that the birth of this new Force should be marked by some signal honour from the King. No higher honour could be given to it than that one of the King's sons should become an officer in the Force, and Prince Albert was available and was the obvious man for the job. So he was gazetted to the Royal Air Force, presumably being seconded from the Navy, as at that time no permanent commissions had been awarded in the R.A.F.

The future King was sent to H.M.S. *Daedalus* (i.e., Cranwell) to be trained in his new duties, and then joined the Independent Air Force, being posted to the staff of General (now Lord) Trenchard. This was particularly useful experience, for there Prince Albert saw the new Force making its first demonstration of independent action. To the squadrons working with the Army the change from R.F.C. to R.A.F. meant little except a change in uniform, if they took the trouble to make the change. But the Independent Air Force was not under the command of Sir Douglas Haig, though it was under the general control of Marshal Foch, the generalissimo on the Western Front. It may have been an error to detach so many bombing squadrons from actual work for the Army at a time when the Germans were making their last great thrust. Those squadrons might have done a lot to hold up the German reinforcements, and at that moment the battle was more important than attacks on German munition factories. But however that may be, the Independent Air Force was certainly a useful experience for the future King. There he learnt something of the possibilities of air action as apart from co-operation with one of the older Services.

It was not until after the Armistice that Prince Albert learnt to fly, and once at a dinner he described himself, with characteristic modesty, as "a very moderate pilot." As he is known to be a good shot and a good horseman, this modesty may be discounted. The circumstances of his busy life since the War have prevented him from keeping in practice and acquiring experience in the art. But he has done one great service to the Royal Air Force. On almost every State occasion between the Armistice and his accession he wore the full dress uniform of the R.A.F., while his father and brothers appeared in naval or military uniforms. If the unique full-dress busby of the R.A.F. is now a familiar sight, thanks for that are mainly due to his present Majesty.

1911 - 1937

A Review of the Progress in British Aircraft Design Since the Last Coronation. Section I: Up to the End of the War Period

(Illustrated mainly with "Flight" Photographs.)

TO appreciate British flying as it existed when His Majesty King George V was crowned on June 22, 1911, it is necessary to go back to the beginning of that year, and to call attention to certain facts and circumstances which formed the background against which contemporaneous events must be viewed if a true picture is to be formed.

British aviation had been struggling along for a couple of years or so with scant encouragement from the Government, and such flying as was carried out was done mostly by wealthy amateurs or by the test pilots of a few of the aircraft firms then in existence. In this connection it may be of interest to recall that in its issue of February 11, 1911, *Flight* published a list of "Aviators' Certificates" as issued by the Royal Aero Club. The list, which numbered 55, began with the name of Lt. Col. J. T. C. Moore-Brabazon, whose certificate was numbered 1. Several who are not only still alive but who are still connected with flying appeared in that list. To mention but a few, the following names appeared, with the numbers of their certificates: Claude Grahame-White (6), G. C. Colmore (15), A. V. Roe (18), F. K. McClean (21), T. Sopwith (31), Sydney E. Smith (33), A. R. Low (34), Lt. G. B. Hynes (40), and G. de Havilland (53).

Records

The position of world's records at the beginning of the year gives an indication of the stage reached by flying. A French pilot, Leblanc, had covered 50 km. (31 miles) in just under 28 minutes (66.75 m.p.h.). An Englishman, Claude Grahame-White, on a French Blériot monoplane, had covered 100 km. (62 miles) in 1 hour 1 minute at an average speed of just over 60 m.p.h. A Frenchman, M. Tabuteau, on a Maurice Farman biplane, had covered a distance of 585 km. (363 miles) non-stop, and Henry Farman, on one of his own biplanes, had remained in the air for 8 hours 12 minutes and 47⅘ seconds (note the two-fifths of a second!). The very greatest speed ever attained over a short straight-line course was 115.3 km./h. (71.75 m.p.h.) by Leblanc on a Blériot, and the world's height record stood at 3,497 m. (11,474 ft.). This last record looks a good deal better than the others, and stood to the credit of A. Hoxey, an American, on a Wright biplane. It will be observed that, with the exception of Grahame-White, not a single Englishman figured in the list of records, and "G.-W." was flying a French machine.

THE scope of a historical review such as the one presented in this issue of "Flight" is so wide that it is more convenient to sectionise it. From 1911 to 1914 there were virtually no military aircraft; from 1914 to 1918 all machines were of this kind; and after 1918 there began a divergence, gradual at first, into two distinct classes, military and civil.

The present article (pages 434–446) deals with the development up to the end of the war. Of the diverging branches, military development since the war is reviewed on pages 446a–447. Civil aircraft development since that time is divided into commercial and non-commercial types (pages 448–451). Further, on pages 454 and 455 will be found some historical notes on British air transport and its instrumental equipment.

The British Government had not begun to realise the significance of flying, and military aviation was to all intents and purposes non-existent until a small start was made in February, 1911, with the establishment by the War Office of the Air Battalion "with a view to meeting Army requirements consequent on recent developments in aerial science." The Air Battalion was a section of the Royal Engineers.

Several flying schools existed around the country at the beginning of 1911, the most notable training centres being Brooklands, Hendon, Eastchurch (Isle of Sheppey), Laffan's Plain and Salisbury Plain. The schools were mostly operated by aircraft manufacturing firms, of which at that time there were a bare dozen.

In view of the small notice which both the Government and the general public took in flying in those days, it is interesting and not a little significant to recall that His Majesty King George V, who had succeeded to the throne on May 6 of the previous year, expressed the wish to see an all-British aeroplane at Windsor Castle, and invited Mr. T. O. M. Sopwith to make the visit. On February 1, 1911, Mr. Sopwith duly flew from Brooklands to Windsor in his Howard Wright biplane with 60 h.p. E.N.V. engine. The significance of the flight lies in the fact that His Majesty particularly wished

to see an all-British aeroplane, for at the time most of the machines used in this country were of French origin or at least had French engines.

One or two references to prize-winning flights made during late 1910 and early 1911 will serve to show what was, at the time, regarded as a noteworthy performance for an aeroplane. Mr. T. O. M. Sopwith won the Baron de Forest Prize by flying his Howard Wright biplane from Eastchurch to Chirimont, in Belgium, a distance of 169 miles, and Mr. S. F. Cody won the British Michelin Cup on a machine of his own design and construction by covering a distance of 186 miles in 4 hours 47 minutes, thereby establishing, in addition to winning the cup, two British records for distance and duration. Cody's engine, by the way, was a 35 h.p. Green, one of the few British aero engines then in existence.

"The Trade"

Sufficient has been said above concerning the state of flying in Great Britain to indicate that the industry was not exactly in a flourishing condition. Government orders were few and far between, and the "trade's" only other customers came from the ranks of the wealthy amateurs. The pioneer aircraft firms were, however, enthusiasts with a boundless faith in the future of flying, and many of them lived an extremely precarious financial existence. Yet one finds that of the companies or individuals who were building aircraft in 1911 no fewer than ten survived, and are to-day world-famous as builders of aeroplanes.

Taking them in alphabetical order, one remembers that Mr. Robert Blackburn was already a well-established aircraft designer and constructor in 1911. The Blackburn Aeroplane Co., of Leeds, manufactured the "Mercury" monoplane, fitted with 50 h.p. Isaacson radial air-cooled engine, the product of another Leeds firm. This was one of the earliest radial engines, but the Isaacson company did not survive for more than a few years. The Blackburn monoplane was of very "clean" design for its time, and would not look particularly antiquated to-day, except, possibly, for its wheel-and-skid undercarriage.

Another aircraft firm which had already made a reputation for excellence of workmanship in 1911 was the British and Colonial Aeroplane Co., Ltd., founded by Sir George White, Bart., whose main business was closely connected with the tramways of Bristol. The earliest Bristol aeroplanes owed much of their design to French influence, particularly to that of M. Henry Farman, being of the type known as "box-kite," with equal-span biplane wings, a Gnome rotary engine of 50 h.p. driving a pusher airscrew, and an elevator in front of the main wings as well as on the tail. The machines were, naturally, very slow, with their vast amount of wing bracing and combination skid-and-wheel undercarriage, but they were considered safe and reliable, and became very extensively used for school work, especially at the Bristol school on Salisbury Plain.

Few of those who happen to meet Captain Geoffrey de Havilland at Hatfield will be aware that he designed, built and flew his first aeroplane in late 1909 and early 1910. In the first two of these activities he was aided and abetted by one Frank T. Hearle, who is now general manager of the De Havilland Aircraft Co., Ltd., but in the latter he was alone, fortunately, for the machine was completely smashed. However, "D. H." was not damaged, and he had learnt quite a lot from his brief hop. Other machines, almost too numerous to count, were to follow in the course of the years; the more recent of these famous types will be well known to readers of *Flight*. By 1911 Geoffrey de Havilland had become a member of the War Office Mechanical Staff, and flew an improved version of his original biplane, designed by him for the Corps of Royal Engineers. When the Aircraft Factory (now the Royal Aircraft Establishment) was formed, de Havilland became its chief designer, and his influence was to be of the greatest importance in the evolution of the "Factory" machines produced during the next few years, notable among them being the B.E. series, which culminated during the early war period in the B.E.2c, the outstanding characteristic of which was its natural or inherent stability.

Another name which has been connected with British aviation from the early days is that of Mr. Frederick Handley Page. At the time when this short history begins, he had progressed a considerable way towards achieving real flying qualities in his machines, and at the Olympia Aero Show of 1911 he exhibited a very

The beginning of real flying may be said to have started with this Avro biplane of 1911. The engine was a 35 h.p. Green. Note the open aft portion of the fuselage. Below is the modern Avro Anson.

Armstrong Whitworth aircraft : The upper picture shows two A.W. "Quads," which were single-seater fighters. The wing arrangement was intended to give a good view for the pilot. The wings were heavily staggered. In the lower photograph is shown the A. W. Whitley bomber of modern times

pretty little machine with wood *monocoque* fuselage and monoplane wings of crescent-shaped plan form. The back-swept wing tips were turned up, and the wing section changed from root to tip, the object being to obtain inherent stability both in pitch and roll. Mr. Handley Page had an office in Victoria Street and works at Creekmouth, Barking, where there was also, what was termed in those days, a flying ground. The 1911 monoplane weighed 450 lb. empty and was advertised at £275. None were sold!

Intimately linked with the earliest days of British flying is the name of A. V. Roe, who, with his brother, H. V. Roe, shares with the Short brothers the honour of being the earliest British aircraft manufacturer. In addition to designing and building his own machines, A. V. Roe also piloted them, so that he is the earliest British designer-constructor. Only one of the Short brothers, Eustace, became a pilot, and he did not learn to fly until he was sixty years of age.

By the time the Aero Show was held at Olympia in March, 1911, A. V. Roe (now Sir Alliott Verdon-Roe) had developed his aeroplanes to a considerable extent, and the fact that he pinned his faith to the so-called "tractor" type with engine and airscrew in front gave his machines an increased aerodynamic efficiency compared with the "pushers" of the time, in which the tail was carried on a maze of struts and wires which offered great air resistance. A. V. Roe was the first to apply the tractor principle to biplanes and triplanes, although the monoplanes of this period had their engines in front. The tractor type has survived throughout the intervening period, and not until the last two or three years has the monoplane come into the picture again for military aircraft.

The 1911 Avro triplane was a two-seater with 35 h.p. Green engine, and had a wing span of 32 ft., with a total wing area of 294 sq. ft. The weight of the machine was 650 lb. empty, so that it will be seen that the triplane wing arrangement seems to have been very light.

Towards the middle of 1911 a greatly improved Avro biplane made its appearance, again fitted with the 35 h.p. Green four-cylinder water-cooled engine. It had a triangular-section fuselage, which afforded little room for the occupants, who sat with most of their bodies exposed to the slipstream. The machine was very successful and was flown a good deal by Howard Pixton and F. P. Raynham at Brooklands.

Twin-engined

Short Brothers started their aviation career as makers of balloons. By 1911, however, they had several years' experience of designing and constructing heavier-than-air craft. At the works at Eastchurch, Isle of Sheppey, quite a number of machines had been built, first Wright biplanes under licence, and afterwards machines of original design. The three brothers, Horace, Eustace, and Oswald, were always able to see a long way ahead, and it is of interest to record here that in 1911 they already foresaw the ultimate need for multi-engined aeroplanes. They had previously built pusher biplanes of the general Henry Farman type of that time, but in the summer of that year they brought out a triple-screw twin-engined biplane in which two 50 h.p. Gnome rotary engines provided two entirely independent power units. The engines were mounted at each end of a short nacelle, the rear engine driving a pusher airscrew and the front engine driving, via chain transmission, two tractor screws. The machine was able to fly on either engine, the speed being then reduced from 55 m.p.h. to 36 m.p.h. The unfortunate pilot had a somewhat unpleasant time sitting between the two engines, although probably no worse than if they had been placed one on each side of him at the same distance.

In 1911 the name of Mr. T. O. M. Sopwith was familiar as that of a young well-to-do sportsman who bought the aeroplane which took his fancy at the moment, but it was not long before he was seized with a desire to construct aeroplanes to his own ideas of what an aeroplane ought to be. He made a very small beginning by purchasing a Wright biplane from America and rebuilding it completely in his hangar at Brooklands. The very peculiar Wright controls were changed to controls of the Farman type, to which Mr. Sopwith had become accustomed, and by the autumn of 1912 the machine had been fitted with an A.B.C. water-cooled engine of about 40 h.p., and had put up a duration flight of nearly four hours in an attempt to win the Michelin prize. From that very modest beginning may

be said to have grown first the Sopwith company and later the Hawker company. The photographs of the two machines, the original Sopwith Wright and the Hurricane, afford an interesting comparison.

Vickers, Ltd., made their entry into the heavier-than-air industry in 1911 with monoplanes built in this country under licence from the French constructor Robert Esnault-Pelterie, whose machines were ahead of their contemporary products in that metal construction was employed to a considerable extent. Already the British company had under construction a rigid airship, the Mayfly, at Barrow, but had not previously attempted to build aeroplanes. Gradually the company introduced improvements and changes in design, and finally broke right away and began original designs from which the present Vickers types have developed.

Precocious

A famous aircraft firm now associated with Vickers, the Supermarine Aviation Works, did not come into existence until 1913, when it was founded by Mr. Noel Pemberton-Billing, whose first machine, the P.B.1 flying boat, was exhibited at the Olympia Aero Show in 1914. It was not a success, but it did include features which have since proved their worth, and may, therefore, rightly be regarded as the foundations upon which the greatness of the Supermarine name were laid.

Although they do not survive, the work done by a number of other firms and individuals in the British aircraft industry has left its mark on British aviation history and thus deserves a brief mention here. Leading place among these firms must be given to Martin and Handasyde, whose very pretty monoplanes made history at Brooklands and elsewhere before the War, and whose biplanes were built in large numbers during the War, when the name became contracted into Martinsyde. The original monoplanes were strongly influenced by the French Antoinette monoplanes, but differed from them in many important respects. Mr. G. H. Handasyde is still actively engaged on aircraft production, having joined the British Aircraft Manufacturing Co., Ltd., in 1935 and having transferred more recently to British Marine Aircraft, Ltd., at Hamble.

Under the title of The Aeronautical Syndicate, Ltd., Mr. H. Barber managed a company at Hendon, where he designed and built the interesting Valkyrie monoplanes, the outstanding feature of which was that they were of the "tail-first" type. The longitudinal stability was good, but directional stability poor. A few years ago the idea was revived, without marked success, by the Focke-Wulf company of Germany.

Another interesting type of aircraft which was destined to be revived many years later was the Dunne. Lieutenant J. W. Dunne was the first to introduce the "tailless" principle and his firm, the Blair Atholl Aeroplane Syndicate, Ltd., did a great deal of experimental work with both monoplanes and biplanes in which there was no tail, but the wings were given a pronounced vee plan form and a "wash-out," i.e. a decrease in angle of incidence from root to tip. During the last decade this principle has been revived by the Westland Aircraft Works in the form of the several Hill Pterodactyls which have been built.

Mr. Howard T. Wright was an independent designer and constructor, with works at Battersea. On one of his biplanes Mr. Sopwith won the Baron de Forest Prize in 1911. Later Mr. Wright joined Samuel White, of Cowes, and there designed the "Wight" seaplanes, which had a peculiar "double-hump" wing section which was thought to give increased lift.

From the point of view of military aviation, the most important event of 1912 was the holding of Government trials on Salisbury Plain for military aeroplanes. This event marked the beginning of an appreciation of the military potentialities of aircraft, and although the machines produced as a result of the trials were not in themselves of great military use, the foundation was laid for subsequent development on military lines.

The Military Trials on Salisbury Plain took place during August of 1912. A considerable number of British and foreign aeroplanes took part, encouraged by the offer of substantial prizes totalling £10,000. An interesting indication of the stage at which flying had arrived at that time is afforded by a brief examination of the conditions for which these large prizes were being offered.

The "live load to be carried" in addition to fuel and oil for 4½ hours, had to be at least 350 lb., which meant pilot and passenger and very little else. Machines had to fly for three hours with this load, this including a flight of one hour's duration at 4,500 ft. The first 1,000 ft. had to be attained at the rate of 200 ft. per min., "although a rise of 300 ft. per minute is desirable," as the regulations had it.

Nowadays one is apt to smile at the demand for speed, which stipulated at least 55 m.p.h. when fully loaded and in still air. By way of demonstrating the gliding angle, the machines were required to switch off their engines at 1,000 ft. and cover a horizontal dis-

An early monoplane (50 h.p. Gnome rotary) designed by Mr. Robert Blackburn is shown in the upper picture. The Isaacson radial was also fitted. Note the position of the pilot's control wheel. An interesting comparison is afforded by the latest Blackburn dive bomber in the lower view.

The Boulton and Paul Bourges (two A.B.C. Dragonflies) came just too late to take part in the War. It was a very manœuvrable machine. The Overstrand (right) is a direct descendant.

tance of 6,000 ft. in still air. In other words, a gliding angle of at least one in six was demanded.

In view of the high power loadings of that day, the demands for take-off and landing now appear fairly severe, although the wing loadings were, of course, very low (4-5 lb/sq. ft.). The machines had to take off from long grass, clover or harrowed land in not more than 100 yards, and had to land on rough ground, including ploughed land, and pull up in not more than 75 yards *without damage*. Most modern aeroplanes would be hard put to it to fulfil this requirement.

In addition to the prizes, the War Office had the option to buy for £1,000 any aeroplane awarded a prize.

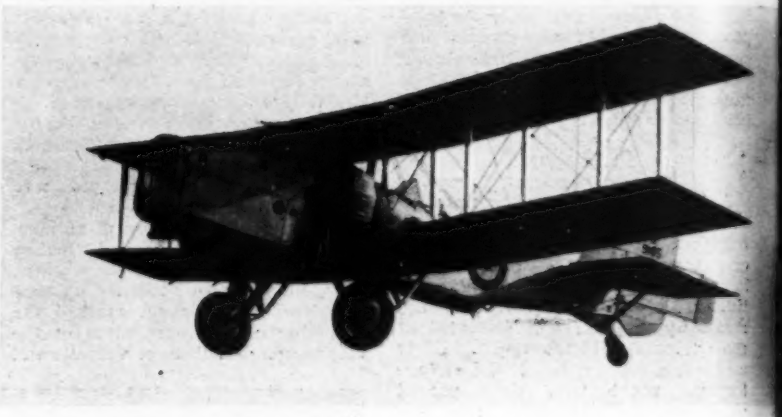
Among the machines entered may be mentioned the following: The Coventry Ordnance biplane (110 h.p. Chenu, water-cooled), designed by Mr. W. O. Manning; two Blériot monoplanes, one with side-by-side seating and the other with tandem seating (the latter had a 70 h.p. Gnome engine); a Breguet biplane with fourteen-cylinder Gnome; and a Maurice Farman "Longhorn" biplane with 70 h.p. Renault eight-cylinder vee air-cooled engine. The Bristol company entered four machines, two biplanes designed by Mr. Gordon England and two monoplanes of Coanda design. The biplanes had 100 h.p. fourteen-cylinder Gnomes and the monoplanes seven-cylinder 80 h.p. Gnomes.

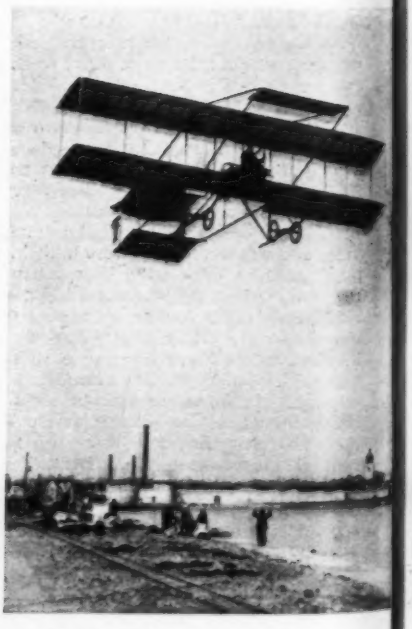
The British Deperdussin Co. entered two monoplanes with fourteen-cylinder Gnomes; there were two Avro biplanes in the competition, one of normal type and one with totally enclosed cabin. Both had Green water-cooled engines. During the trials Lieut. Parke, R.N., got the enclosed-cabin Avro into what was probably the first spin to be recorded. At the time the spin was unknown, and Parke's experience became known as "Parke's spiral dive." After trying the instinctive control movements, Parke tried some which he considered hopeless, but they brought the machine out of the dive and he landed safely.

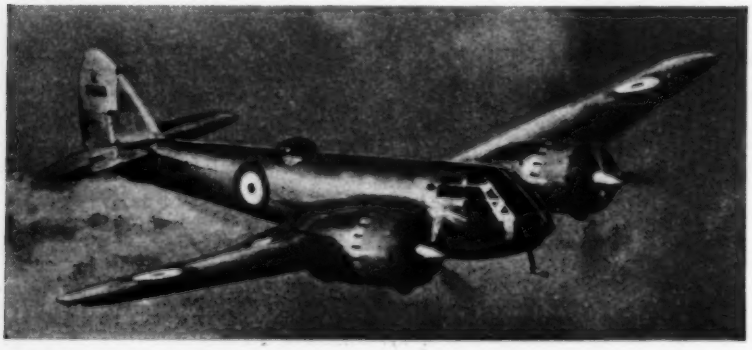
Mr. Handley Page had entered a little monoplane with 70 h.p. Gnome engine. Mr. Howard Flanders, who was at that time established at Brooklands, had entered a biplane with a 100 h.p. A.B.C. engine. Martin and Handasyde had entered one of their monoplanes with 75 h.p. Chenu engine.

Vickers were represented by a monoplane with 70 h.p. Viale radial air-cooled engine. As was to be expected this machine resembled the R.E.P. prototype in its general lines, and was the only monoplane in the trials to be built largely of steel.

S. F. Cody had entered two







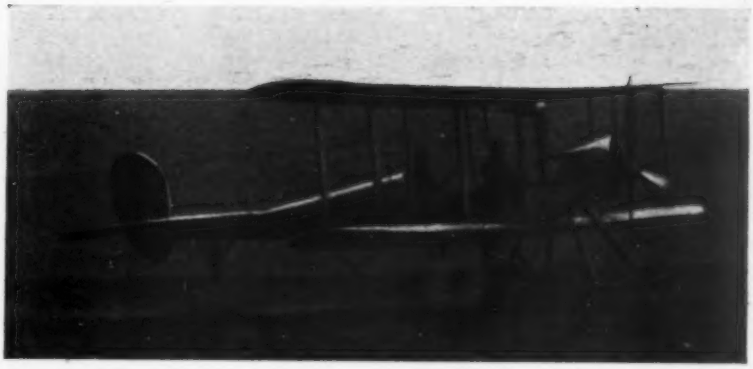
Bristol beginnings are shown in above picture, which shows Graham Gilmour flying a Bristol "Box-kite" from the Maslar sea wall in 1911. The Bristol Blenheim bomber on the left indicates the progress made.

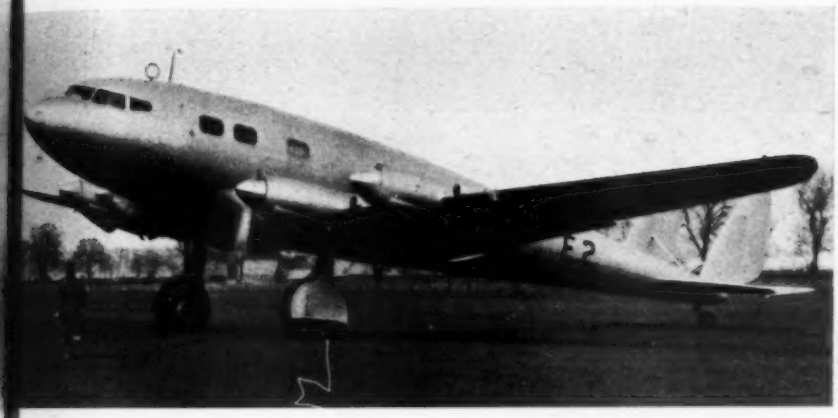
machines of his own design and manufacture, of which one was a biplane and the other a monoplane. The competition was ultimately won by Cody on his biplane, but the machine was of no use for military purposes and was never ordered in quantities.

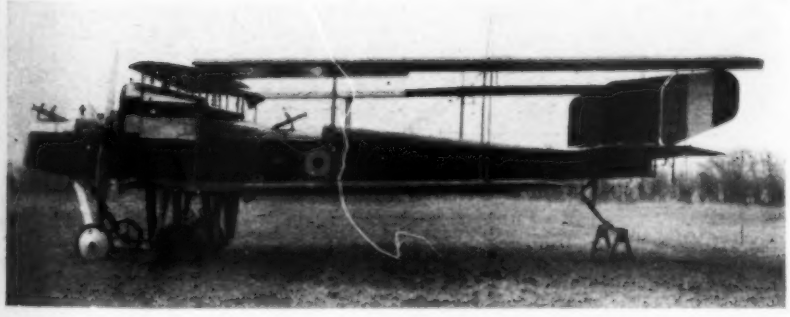
It is of interest to record that out of all the machines which took part in the 1912 Military Trials all used wing-warping for lateral control except the Maurice Farman and the Cody biplane, which had ailerons mounted in the gap between the wings.

An event which had a considerable effect on the future of British aviation was the ban on monoplanes imposed by the War Office early in 1913, as the result of a series of accidents to machines of this type. This ban, of course, applied to military aircraft, as there was virtually no official control of civil flying. There can be little doubt that, even after the ban was ultimately lifted, there still lingered in the minds of many a suspicion that perhaps the monoplane *was* more dangerous than the biplane, and this may have deterred several designers from producing monoplanes, and may thus have helped to produce that preference for biplanes which a few years ago became something of a joke against British aviation.

During 1913 two aeroplanes were produced which were destined to "make history" during the War.







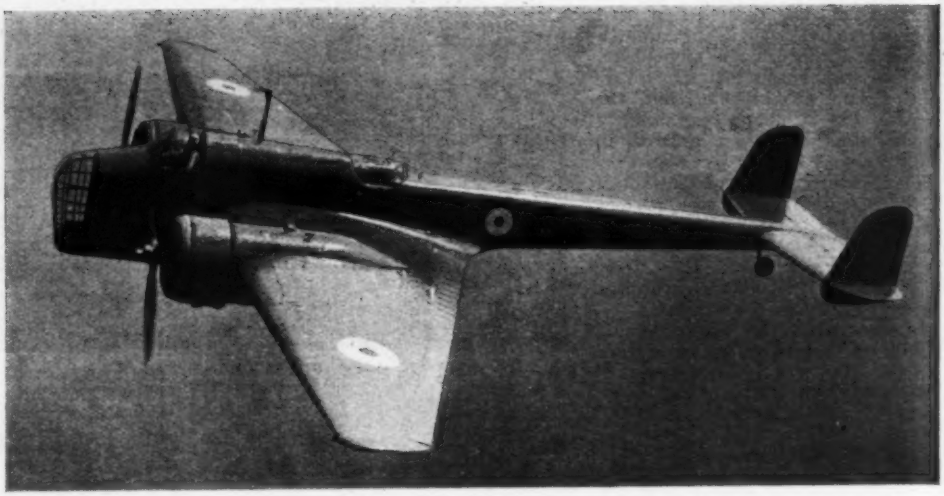
Not the D.H.1 : Capt. G. de Havilland was responsible for the design of the B.E.2 shown above, but this was not his first machine. The D.H Albatross on the left is his latest design.

One was the Avro 504 with 80 h.p. Gnome rotary engine. This machine, in but slightly modified form, was used to some extent for bombing during the War, and to an enormous extent for training, not only during the War but for many years afterwards, when it was the standard training type of the R.A.F.

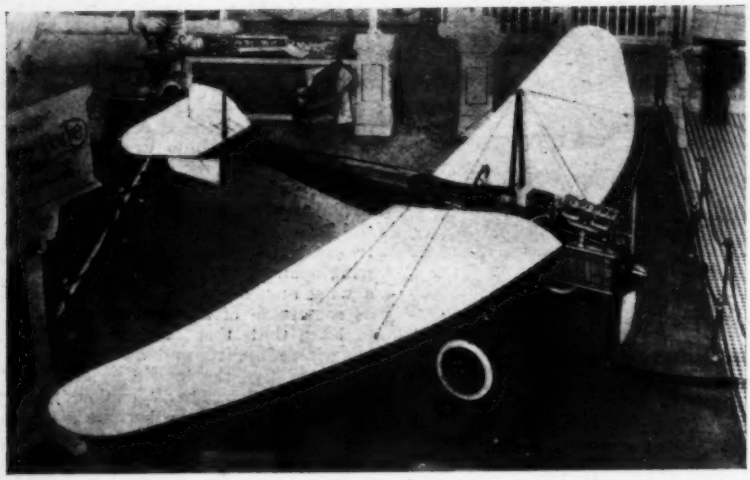
The other machine was the tiny Sopwith biplane with 80 h.p. Gnome engine, which later, owing to its diminutive size, became known as the "Tabloid." It was a side-by-side two-seater equal-span biplane, with a wing span of about 25 ft. 6 in. and a wing area of 240 sq. ft. It comes as something of a surprise nowadays to learn that this machine weighed but 670 lb. empty, and with pilot and 3½ hours' fuel the loaded weight was only 1,060 lb. The "Tabloid" in slightly modified form became a very useful scout, and when fitted with floats a development of it was good enough to win the Schneider contest in 1914. The "Tabloid" had a speed of nearly 92 m.p.h. The seaplane version was used to a considerable extent by the R.N.A.S.

Another small single-seater which was later to become popular as a

The first machine designed and built by the Fairey company was the F.2 shown at lower centre. It was a twin-engined bomber and is shown with wings folded. The picture of the Battle affords an interesting comparison.



In the H.P.52 or Hampden slots and flaps have taken the place of the early plan form, and the power has gone up to about 1,500 h.p.



Before the days of slots. Below is a view from above of the 1911 Handley Page monoplane with 35 h.p. Green engine. Note the crescent - shaped wings.

military machine made its appearance at the Olympia Show of 1914. This was the Bristol Scout, with 80 h.p. Gnome engine. Slightly smaller even than the Sopwith "Tabloid" (span 22 ft. and wing area 156 sq. ft.) this machine had a top speed of 95 m.p.h.

Also during 1914 appeared the Vickers "gun-bus," which represented a complete breakaway for that firm, who had previously been in favour of the monoplane and had built R.E.P. machines under licence. The "gun-bus" was a pusher biplane with 100 h.p. Gnome *monosoupape* engine, the nacelle providing a fine view and good field of fire for the gunner. During the War this type was used extensively.

For the Circuit of Britain seaplane race scheduled for August, 1914, nine machines had been entered. The Sopwith Company entered a tractor seaplane two-seater rather like the Schneider winner in general design, and also a "Bat-boat." Tractor seaplanes were also entered by Blackburns and Avros, and White and Thompson entered two Curtiss flying boats, for which they held the British rights. The race was, of course, called off, but several of the machines were sold to the Government, and some went into service with the R.N.A.S. The experience obtained in building them became valuable when the demand for seaplanes arose.

The War Period

When War broke out in August, 1914, the British aircraft industry was, as will have been gathered from the preceding pages, a mere nucleus of small and unorganised firms. The services consisted of two "wings," a Naval and a Military, known respectively as the Royal Naval Air Service and the Royal Flying Corps. The R.N.A.S. was controlled by the Admiralty and the R.F.C. by the War Office. It seems almost ludicrous nowadays that at the outbreak of war the R.N.A.S. had 93 machines and the R.F.C. 179. Under the stimulus of the War that number grew to approximately 22,000 machines at the time of the Armistice. That, of course, meant an almost incredible expansion of the aircraft industry. For instance, during the first twelve months of the War the average delivery of aircraft from British and foreign sources was 50 machines per month. During the last twelve months of the War deliveries averaged 2,700 per month, and at the time of the Armistice it is estimated that the country's output capacity was 3,500 per month.

During the early stages of the War aeroplanes were used for reconnaissance only, and they carried no military load. Very soon, however, the need for armament made itself felt, and the first result was that the reconnaissance aeroplanes were loaded up with guns and other equipment to an extent which spoilt their performance. Not until the latter part of 1916 did specialised military aeroplanes begin to come into use, and when that happened performance improved greatly, not merely because of the specialisation, but also as a result of fitting the more powerful engines which had by then become available.

To form a picture of the way in which performance improved, it is useful to divide the aircraft types broadly into classes, such as the single-seater fighter, the two-seater fighter, the bomber, and the ground fighter or armoured aeroplane.

When Lewis guns were first fitted on aeroplanes they were mounted outside the airscrew disc and were operated by Bowden cable. The attachment of the gun and its operating gear was heavy and cumbersome, and considerably reduced performance. Towards the end of 1915 the Germans introduced a system of synchronising the gun trigger with the engine so that the bullets passed between the airscrew blades. Our Vickers guns were quickly adapted to work in a similar way, and during the

latter part of 1916 we had caught up with the Germans in this particular direction. The first gun gears were of a mechanical type, but later the Constantinesco hydraulic type of interrupter gear was introduced and proved to be a great improvement.

Probably the first really successful tractor single-seater fighter to be used in large quantities during the war was the Sopwith "Pup," a small biplane fitted with an 80 h.p. le Rhone rotary engine. The machine loaded weighed but 1,225 lb., and it had a speed of 106 m.p.h. at ground level. It climbed to 15,000 ft. in half an hour, and had a ceiling of 17,500 ft.

Fighting View

During the long period in which the "Pup" was used, view as well as manœuvrability became important. The Sopwith triplane with 130 h.p. Clerget rotary engine was then introduced, and gave an increase in performance, its speed being 112 m.p.h. and its ceiling 20,500 ft.

The Sopwith triplane was somewhat complicated to build, and needed a good deal of rigging attention in the field. These and other considerations led to the virtual standardisation of the Sopwith "Camel," which was unstable but very manœuvrable. With an armament consisting of two fixed guns instead of one, the Camel had a speed of 117 m.p.h. at 10,000 ft. when fitted with the 100 h.p. Gnome *monosoupape* (single-valve) engine. Its ceiling was 23,700 ft.

A later single-seater fighter to be used in large numbers was the S.E.5, designed at Farnborough and built in numerous factories up and down the country. With a 200 h.p. French Hispano engine its performance was better than that of the Camel, but it was held to be less manœuvrable, and pilots were by no means unanimous in their preferences.

The last single-seater fighter of the War period was the Sopwith Snipe. Fitted with a B.R.2 rotary engine of 230 h.p., this machine had a speed of 121 m.p.h. at 10,000 ft., and its ceiling was 20,500 ft.

In the two-seater fighter class there was also great improvement in performance during the War, although not, perhaps, quite so marked as in the case of the single-seaters. The early machines were "pusher" biplanes, with the engine mounted behind the wings and the crew seated in a short nacelle. The tail was carried on an open girder which offered great wind resistance; consequently the performance of these machines was relatively poor. Well-known examples were the Vickers "gun-bus," the De Havilland D.H.1, and the Farnborough-designed F.E.2. The latter had water-cooled engines, while the Vickers and De Havilland had Gnome rotaries.

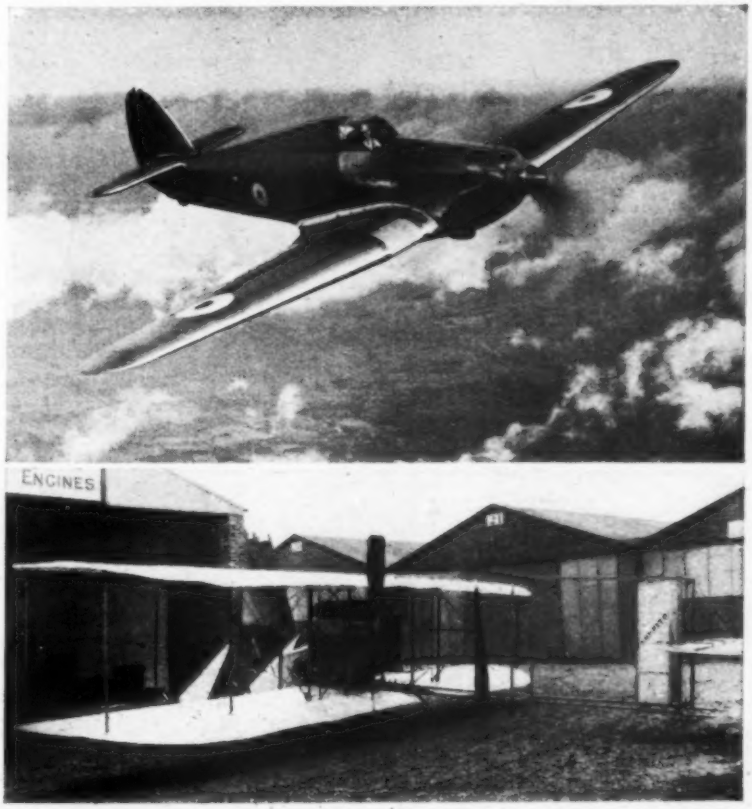
When performance became really important, the "pusher" type was found inadequate, and the tractor type, which had proved its aerodynamic superiority, was introduced in this class also. The first successful type of two-seater tractor fighter was the Sopwith one-and-a-half-strutter, so-called because the span of its single-bay biplane bracing was reduced, in the case of the top wing, by sloping the centre-section struts outwards at a pronounced angle.

In the meantime the Rolls-Royce company had produced the Falcon engine, a twelve-cylinder water-cooled vee of 270 h.p. This was installed in the Bristol F2B, designed by Capt. Barnwell. That machine became exceedingly popular, not only because of its good performance, but also because the pilot was placed well back and close to his gunner so that communication became easier. Many authorities hold that the old "Brisfit," as it was familiarly called, did more than any other type to establish British superiority over the enemy.

To illustrate the improvement in performance of two-seater fighters during the War, it may be pointed out that in March of 1915 the average speed was 60 m.p.h. (that of the old "pushers"). By September, 1918, the average speed had nearly reached 120 m.p.h. Similarly, the time required to climb from ground level to 10,000 ft. was reduced from fifty minutes to ten.

Once it had been demonstrated that aeroplanes could carry a certain amount of military load in addition to fuel and crew, their use for bombing was fairly obvious, and in time specialised aeroplanes were produced for day bombing and night bombing. To begin with, the old B.E.2 was used, and a certain number of Avros with 80 h.p. Gnome engines, but these were soon supplanted by aeroplanes specially designed for bombing. The earliest attempts were necessarily crude. Bombs were carried in ingenious ways, and launching was by pieces of string cut with special knives. Needless to say, the accuracy was not of a high order unless the pilot dived to a very low altitude before releasing his bombs.

Before long it became evident that specialisation and sub-division into day bombers and night bombers was desirable, and in each class several types were produced. The Aircraft Manufacturing Co., Ltd., began with the D.H.4, which was fitted with different engines from time to time. In this machine, however, there was little room for bomb stowage, as the pilot



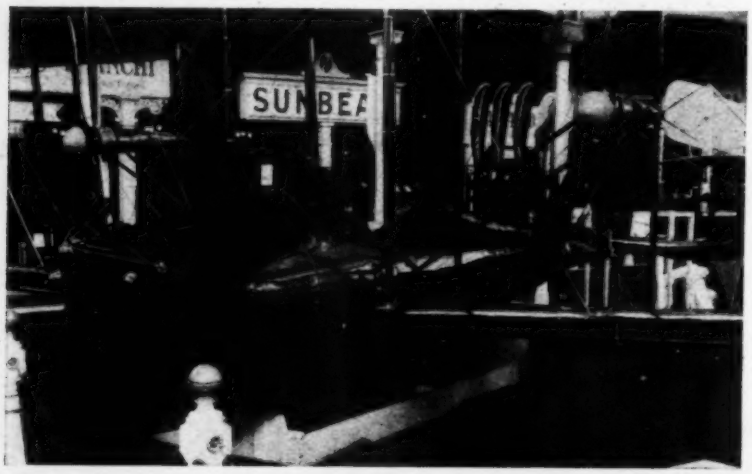
Mr. T. O. M. Sopwith began his career as a constructor by converting an American Wright biplane. The pilot was sheltered by a short nacelle placed to the right of the engine. Note chain drive to the twin airscrews. The Hawker Hurricane single-seater fighter is shown in the upper photograph.

The Parnall Plover (above) was a single-seater fighter. The machine on the right is the latest Parnall General Purpose aeroplane.

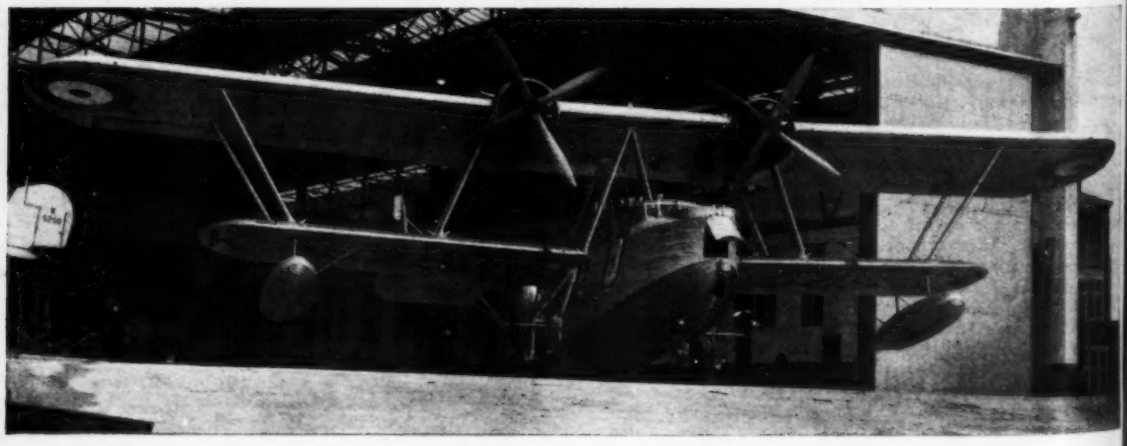
sat under the top plane. The D.H.9, originally fitted with the Siddeley Puma of 230 h.p., was perhaps the first two-seater day bomber to combine fairly long range (560 miles) with a fairly large military load (545 lb.). A later version, known as the D.H.9A, was fitted with the 400 h.p. Liberty engine, and had a speed of 130 m.p.h., a range of 650 miles at full speed, and a ceiling of 21,000 ft. The military load was 545 lb. Also classed as a day bomber was the D.H.10, a twin-engined biplane with two Liberty engines. The speed and range of this machine were similar to those of the 9A, but the military load was 1,000 lb.

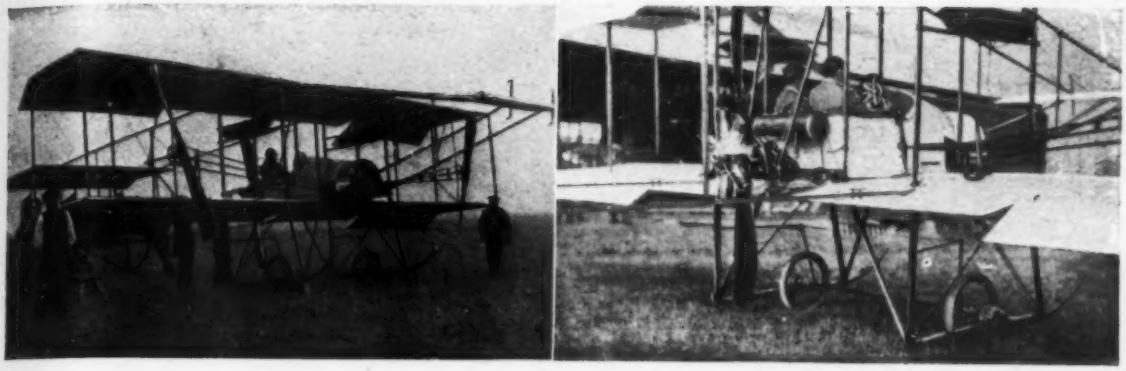
Between September, 1915, and September, 1918, the average speed of day bombers at 10,000 ft. increased from 55 m.p.h. to about 117 m.p.h.

Night bombers developed, as did day bombers, from the B.E.2. Later the F.E.2 "pushers" were used, as they had a fairly good military load and good view for bomb sighting. When great range became necessary, special twin-engined biplanes were developed, of which the outstanding examples were, perhaps, the Vickers Vimy and the Handley Page 0/400. Both these machines were fitted with Rolls-Royce Eagle engines of 350 h.p. each. The Handley Page 0/400, which came into use early in 1917, and

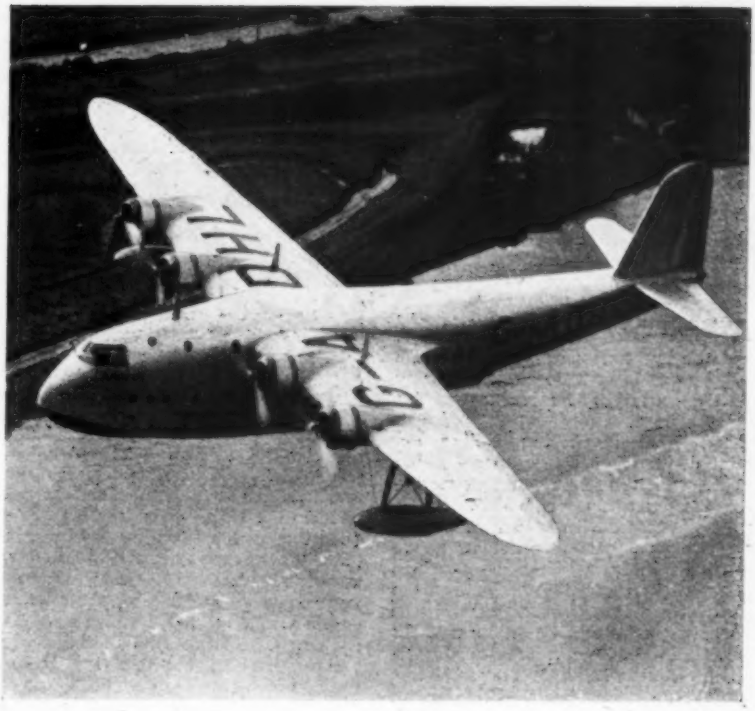


S. E. Saunders, of Cowes, built the hull for the first Sopwith "Bat boat." The Perry-Beadle boat shown on the left was built by him in 1914. The firm is now known as Saunders-Roe, and the Saro London is shown below.





As early as 1911 Short Brothers realised the advantages of more than one engine. The upper pictures show a Short biplane with two Gnome rotary engines, of which the rear drove a pusher airscrew while the front drove two tractors via chain gearing. On the right is one of the Empire boats.



was the first really effective night bomber, was the design chosen for the big night bomber programme of late 1917. The Vickers Vimy came rather later and remained in service for many years after the end of the War. Its military load varied, of course, with the fuel tankage provided. With a range of 835 miles, the military load was 2,870 lb. Increasing the range to 1,080 miles reduced the military load to 2,150 lb. The ceiling was, in both cases, 10,500 ft., and the speed 98 m.p.h. at 5,000 ft.

By the end of 1917 it was decided that improved aircraft range had brought Berlin within bombing distance of England, and the Handley Page V/1500 was designed specifically with this objective in view. The long flight and low speed meant that the machine could not cover the whole double journey in darkness, so a fairly large crew (seven) with defensive armament had to be carried in addition to the bomb load. Four Rolls-Royce Eagle engines were fitted, arranged in tandem pairs, one of each pair driving a "pusher" airscrew and one a tractor. Three days before the Armistice two of these machines were standing by, ready for the attempt, which was never made.

Marine Aircraft

The Wartime development of British marine aircraft is, of course, closely linked with the history of the Royal Naval Air Service. When war broke out in 1914 the R.N.A.S. had some 50 seaplanes, of which approximately one-half were ready for service. They were a somewhat heterogeneous collection, but on the whole were farther advanced than the aircraft of the Royal Flying Corps, particularly in the matter of engine power, armament and the use of wireless.

At Eastchurch, Isle of Sheppey, Short Brothers had done a great deal of experimental work on seaplanes, first with their older pusher types with floats substituted for the wheel undercarriage, and later with tractor biplanes fitted with floats. The Sopwith company also had been experimenting, and had the distinction of having won the Schneider contest at Monaco with a tiny float biplane piloted by Mr. Howard Pixton. Samuel White, of Cowes, had produced the Wight seaplane, designed by Mr. Howard Wright. Generally speaking, the floats of these early seaplanes were mere flat boxes of wood, with the bottom curved upwards in front and the deck curved downwards at the stern. There were no steps, and the floats were usually so short that a third float, placed under the tail, was used for preventing the machine turning over backwards. An exception was the Wight seaplane with 200 h.p. Salmson radial water-cooled engine driving a pusher airscrew. This machine had very long floats with steps and no tail float.

A. V. Roe had produced tractor seaplanes, in fact an Avro machine was the first seaplane to get off the water in this country, but did not specialise on the type as did some of the other firms, notably Short Brothers.

The flying boat was just beginning to make its appearance. The Sopwith company had designed and built a so-called "Bat-boat" on which, in 1913, Mr. Harry Hawker won the Mortimer Singer Prize by making five flights from the land, alighting on the sea, taking off and alighting on the land again, the machine being an amphibian. The feature of the design was that the boat hull itself was quite

The latest Supermarine flying boat, the Stranraer, is shown on the left. Note the simple bracing.

(Below)
The first Supermarine, the P.B.1, at Olympia in 1914. It had such "modern" features as circular-section hull, carefully cowled Gnome engine and three-bladed airscrew.

short, the tail being carried on outrigger as on pusher landplanes of the period. The Mortimer Singer Prize was won with a 100 h.p. Green engine, but at the Olympia Show in 1914 a similar machine was exhibited with a 200 h.p. Canton-Unné radial water-cooled engine built in England by the Dudbridge Iron Works.

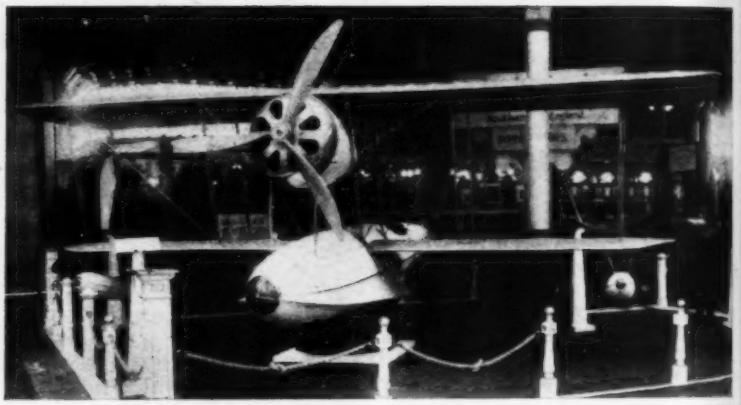
Among flying boats shown at Olympia that year was a curious one designed by Messrs. Perry and Beadle and built by S. E. Saunders, of Cowes. This machine had the engine in the hull, with chain transmission to airscrews mounted between the planes, and the lower wing was planked with wood so as to provide lateral stability on the water. The machine was not a success.

Mr. Noel Pemberton Billing exhibited the first Supermarine flying boat, which had a circular-section wooden hull and a single step. It was a single-seater, with a 50 h.p. Gnome rotary engine carried on struts above the hull, in front of the wings. The airscrew was a three-blader to keep down the diameter. The machine as such was a failure, but it formed the beginning of the fame of Supermarines, Mr. Billing's interest being bought up later by Mr. Hubert Scott Paine and Commander James Bird, passing afterwards to the Vickers group.

A *Race Cancelled*

Shortly before War broke out, a seaplane race around Great Britain had been planned, and a number of machines had been specially built for the race, which had to be cancelled. Such of these as were of any use for service were taken over, but few of them made history during the War.

The Royal Naval Air Service began quite early to experiment with the dropping of torpedoes from seaplanes, the beginning being made at the Naval Review of July, 1914, when a Short seaplane with 160 h.p. engine dropped a 14-inch torpedo, fitted in a very makeshift manner. Progress in torpedo-dropping was, however, comparatively slow, and it was not until 1916 that the Sopwith



company designed the "Cuckoo," which was built by Blackburns, that really specialised torpedo aircraft came into being, and that machine was not a seaplane. Of the twin-float seaplanes used during the War one of the most popular was the Short 225, which was a normal tractor biplane with very large overhangs of the top plane. The engine was a 225 h.p. Sunbeam water-cooled. The large span of the upper wing gave Shorts the idea of designing the wings so that they could be folded alongside the fuselage, and in years to come this practice was to become universal for aircraft which had to be stored in a small space, such as on board aircraft carriers.

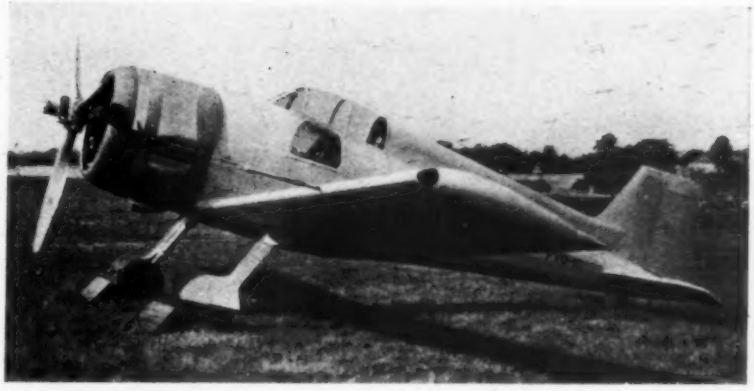
On the flying-boat side the development was in the direction of increased size. The original Sopwith "Bat-boat" was quite small, with a loaded weight of but 3,200 lb. Shortly before the war Lieut. J. C. Porte, R.N., went to America to supervise the building of a flying boat by the Curtiss company. On this boat he had hoped to fly across the Atlantic, but the War put a stop to the attempt. Lieut. Porte returned to this country and entered the R.N.A.S. The Curtiss "America" developed into the White and Thompson, and later into the Norman Thompson types or "Small America," as it became known. This was built by Saunders, of Cowes. A larger Curtiss boat, with two engines, became known as the "Large America."

When Lieut. Porte was put in charge of the R.N.A.S. Station at Felixstowe, he took the opportunity further to develop the Curtiss designs, and his first large flying boat, which was given the nickname "Porte Baby," was built by May, Harden and May. The types which did most service during the War were, however, the series known as the "F" class, of which two, the F3 and the F5, became famous and did most of the patrolling of the North Sea. These boats were fitted with two engines mounted in the gap between the biplane wings. They were, of course, of all-wood construction, and the hull shape showed straight-line frames with projecting chines, the extra planing bottom provided by these being necessary to get the machines off the water.

A later type, the first of which was designed at the Admiralty and was known as the A.D. type, had circular cross-section and a more resilient hull. Afterwards Mr. H. Scott Paine and Mr. Linton Hope improved upon this early beginning of the circular hull, and these designs became known as the P and N classes.

Space does not permit a detailed description of these Wartime flying boats, but a few figures may be of interest in forming a basis for a comparison of the early flying boats with

The R.E.P. monoplane shown above was one of the first to be built in this country by Vickers, Ltd. It had an R.E.P. semi-radial or "fan" shaped air-cooled engine. Steel construction was employed. On the right the modern Vickers Venom.



the latest British types. The F3 was powered by two 350 h.p. Rolls-Royce Eagle engines, and the gross weight was 9,750 lb. while the hull was dry. After prolonged service the wood of the hull planking would soak up a considerable quantity of water, which might in some cases amount to several hundred pounds. The speed at 2,000 ft. was about 81 knots (93 m.p.h.). The F.5, with the same engines, weighed 9,630 lb. loaded and had a speed of 88 knots (101 m.p.h.). The P.5 had a considerably lower gross weight than either of the F types, and its performance, with the same engines, was better, with a top speed of 91 knots (105 m.p.h.).

Newcomers

The enormous expansion which took place during the War brought into the aircraft industry a large number of firms which had not previously been concerned with aircraft manufacture. After the Armistice in 1918 most of these returned to their pre-War occupations, but a few foresaw a great future for aviation and decided to remain in the aircraft industry. Some did so for a time, and then gave up the struggle for existence which accompanied the slump a few years after the War. A few "stuck it" and are still, fortunately, with us, to the great benefit of the country's present needs. They include such well-known names as Armstrong Whitworth, Boulton and Paul (now Boulton Paul), Fairey, Parnall, and Westland.

Strictly speaking, Sir W. G. Armstrong Whitworth and Co. should be classed among the firms which began aircraft construction before the War as they built a biplane of the Farman type in 1912, but the aviation department was not formed until later, when biplanes of the Farnborough-designed B.E.2A and B.E.2B were built. Early in the War the aircraft section was vastly extended, and large numbers of B.E.2C biplanes were built. During this period Mr. F. Koolhoven, a Dutchman who became a naturalised British subject, joined the firm and became chief designer. From his name were taken the initials used to identify A.W. types of his design. In addition to many experimental types, the following went into production and took part with credit in the prosecution of the War.

The F.K.3 was a tractor biplane with 90 h.p. R.A.F. engine, and was in the same class as the B.E.2C. This was replaced by a larger and improved type, the F.K.8 with 160 h.p. Beardmore engine. The first single-seater fighter type to be produced by the firm was the F.K.10, which was a quadruplane with 130 h.p. Clerget rotary engine. The quadruplane wing arrangement was chosen in order to give the pilot a better view. The wings were very heavily staggered.

Boulton and Paul, Ltd., of Norwich, were, and are, a large firm of building constructors. In 1915 they formed an aviation department, with works at Riverside, Norwich. The first aeroplane to be built was an F.E.2B, but in 1917 original design was undertaken and Mr. J. D. North was appointed chief designer. The first Boulton and Paul aeroplane was a single-seater fighter called the Bobolink. It had a 230 h.p. B.R.2 rotary engine, which gave a speed of 125 m.p.h. at 10,000ft. This was followed, late in the War, by the Bourges twin-engined bomber with 320 h.p. A.B.C. Dragonfly radial air-cooled engines. The Bourges had a speed of 124 m.p.h. at 10,000ft. and was probably the first twin-engined aeroplane to be "aerobatted." Recently Boulton Paul was made a separate company, and transferred to Wolverhampton.

The Fairey Aviation Co., Ltd., was founded by Mr. C. R. Fairey in 1916. Few people nowadays know that the first machine to be entirely designed and built by the Fairey Company was a twin-engined biplane known as the F.2. It was in many respects ahead of its time, and with two Rolls-Royce engines of 190 h.p. each had a top speed of 93 m.p.h.

The first production type of aircraft to be built by the Fairey Aviation Co. was the Campania, a twin-float tractor seaplane with short floats and a smaller float under the tail. This machine was fitted with different engines, such as the Sunbeam Maori, and Rolls-Royce Eagle. In January, 1916, the first of these machines was flown from the Isle of Grain to Scapa Flow by Sqn. Ldr. Maurice Wright, now a director of the company. Subsequent versions of the Campania were known as the F.16, F.17 and F.22. The Campania was followed by the F.127(N.9), a patrol seaplane with 190 h.p. Rolls-Royce engine, and then came the type F.3, which was actually a modified F.127 fitted with the 260 h.p. Sunbeam engine. The F.3

The first machine to be designed by the Westland Aircraft Works was the Wagtail single-seater fighter.

The latest Westland is the Lysander army co-operation monoplane.

"Panther," which was a ship plane with 200 h.p. B.R.2 rotary engine. Its outstanding feature was that the fuselage folded alongside the starboard wings, instead of folding the wings on both sides along the fuselage.

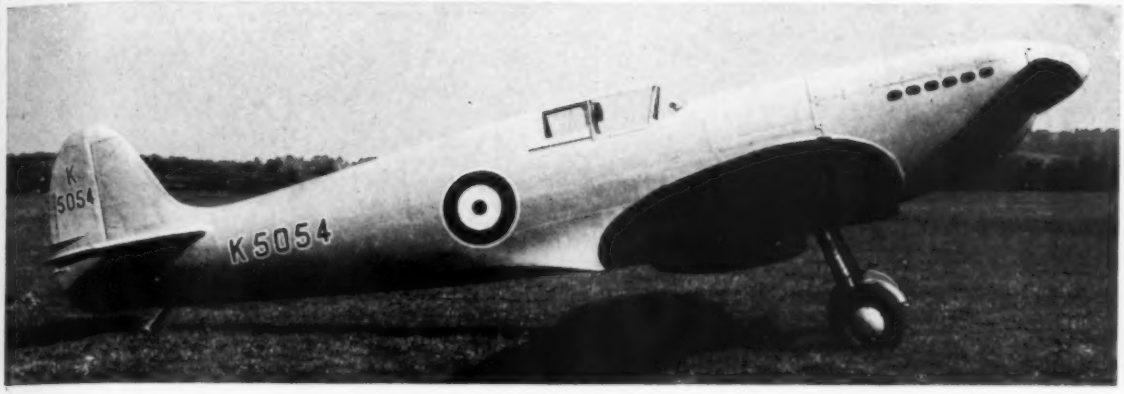
The Westland Aircraft Works was founded in August, 1915, as a branch of Petters, Ltd., of Yeovil. At first, construction only was undertaken, the types built including Short seaplanes, Sopwith 1½-strutters, D.H.4's, D.H.9's and D.H.9A's. At the close of the War the firm produced the Westland Wagtail, a single-seater fighter, and the Weasel, a two-seater fighter. Since the War Westlands have, of course, produced a number of types, some of which are dealt with elsewhere. In 1935 Westland Aircraft, Ltd., was formed as a separate company, with Sir Ernest Petter as chairman and Capt. P. D. Acland as managing director.

may be said to have marked the real beginning of Fairey greatness, as it developed in time into the famous 3C and even more famous 3D.

George Parnall and Sons, of Bristol, were originally manufacturers of high-class shop fittings. During the War they turned to aircraft manufacture, first building aircraft designed by others, but afterwards producing original designs. Perhaps the most interesting of these was the Parnall

Forthcoming Events

May 6. Aero Golfing Society: Instone Trophy.
May 9. R.Ae.S. Garden Party, Great West Aerodrome, Hayes.
May 12-19. Austrian Aero Club: Austrian Whitsun Flight.
May 13. Leicester Airport Coronation Air Display.
May 15. Cardiff Aero Club: Coronation Rally.
May 15-18. Yorkshire Gliding Club: Whitsun Meeting, Sutton Bank.
May 15-18. Derbyshire and Lancashire Gliding Club and Midland Gliding Club: Competition, Great Hucklow.
May 17-23. Derbyshire and Lancashire Gliding Club Training camp, Great Hucklow.
May 26—June 6. Brussels Aero Show.
May 26-30. Austrian Aero Club: Salzburg Gliding Contest.
May 27. R.Ae.S. Wilbur Wright Lecture: "Turbulence," by Dr. Theodor von Karman. Science Museum, South Kensington.
May 29. Empire Air Day.
May 29-31. London-Isle of Man Race and Round-the-Island Contests.
June 4-6. York and Leeming Club: International Meeting, York.
June 11-14. Hungarian Aero Club: International Conference.
June 12. Bristol and Wessex Aeroplane Club: Garden Party, Whitchurch.
June 15-20. Magyar Pilota Picnic, Hungary.
June 20. R.Ae.C. of Belgium: Gordon Bennett Balloon Race, Brussels.
June 21-28. Federation Aeronautique Internationale: London Conference.
June 26. Royal Air Force Display, Hendon.
June 28 and 29. S.B.A.C. Display, Hatfield.
July 1. Aero Golfing Society: *Flight* Trophy.
July 3. Newcastle-on-Tyne Aero Club: London-Newcastle Race.
July 3. Ramsgate Airport, Official Opening.
July 4-18. Aero Club of Germany: Wasserkuppe Gliding Meeting.
July 10. Cardiff Aeroplane Club: London-Cardiff Race.
July 11. Italian Aero Club: Circuit of Rome.
July 15. Aero Golfing Society: Jubilee Cup.
July 17. Portsmouth Aero Club: Garden Party.
July 23.-August 1. Swiss International Meeting.
July 24. Devon Air Day and Race: Plymouth and Exeter.
July 31. Cinque Ports Flying Club: Folkestone Aero Trophy Race.
July 31-August 2. Yorkshire Gliding Club: Opening Meeting, Sutton Bank.
August 1-14. Yorkshire Gliding Club: Instructional Camp, Sutton Bank.
August 1-31. New York-Paris Air Race Flights.
August 3-September 7. Public Schools Aviation Camp, Norwich.
August 6-7. Austrian Aero Club: International Rally, Lake Worth.
August 14-22. Yorkshire Gliding Club: Open Contest, Sutton Bank.
August 21. Thanet Aero Club: Aviation Meeting and Race.
August 21. Midland Aero Club: "At Home."
August 22-29. Italian Aero Club: Circuit of Littorio.
August 28 and 29. Cinque Ports Flying Club: Lympne International Rally and Wakefield Trophy Race.
August 28-September 25. B.G.A. National Soaring Competition, Great Hucklow.
September 10-11. R.Ae.C.: King's Cup Race.
September 12. Aero Club de France: Coupe Deutsch de la Meurthe, Etampes.
September 23. Aero Golfing Society: Ceilon Trophy.



The Merlin-engined Supermarine Spitfire is the fastest military aeroplane in the world.

AIRCRAFT MILITANT, 1919-1937

Historical Section II : Some Service Types from "Demob." to Expansion

(Illustrated by "Flight" Photographs)

"IF the war had gone on a little longer" is a phrase which would be hard to exclude from any discussion on military aircraft of post-war years. When we settled down to our fight for peace we had on our hands some aircraft which unquestionably would have left their mark on German centres, and, more indelibly, on the pages of history. But as designers groped for guidance into what they hoped would be the Elysian Fields of civil aeronautics the pace of development slackened, and there followed a period of characteristically British peace-time "plodding."

Taking the broad view of the past eighteen years, we must be thankful that our technicians have done as well as they have in keeping the Service supplied with sound aeroplanes, for orders have been thin. Happily we have been able to establish good connections in the export market which have given stimulus to development in certain directions. The way in which manufacturers have come up to scratch in constructing prototypes superior to anything of their kind abroad, on which we have been able to base our Expansion policy, and their efforts toward efficient quantity production, have been magnificent.

A review of post-war military types is best approached systematically, particularly in view of the multifarious official classifications which have arisen, lapsed or stood.

Single-seaters

Fighters.—In spite of incessant predictions of inevitable extinction the single-seater fighter is still very decidedly with us. True, the time has come when many of its characteristics must undergo a metamorphosis or be supplanted entirely, but as a carriage for fixed guns its usefulness seems by no means so near an end as many tacticians would have us believe.

Development from 1919 to 1935 was along very definite lines, all types accepted for service during that period being biplanes armed with two machine-guns.

The Sopwith Snipe, retained as standard equipment for a short time after the war, was the last first-line aircraft to mount a rotary engine (the Bentley B.R.2), and was soon to give way to machines with much more power at their disposal. Some notable experimental fighters, including the A.W. Siskin (very different from the Siskin known to the Service, although it was a sesquiplane with the same substantial undercarriage), and one or two others born under less fortunate auspices, made their appearance. By 1923 Bristols had completed their experimental Bullfinch with 400 h.p. Jupiter engine. A parasol monoplane, the Bullfinch, had wings which thinned down toward their tips and over the centre section. Glosters, improving on their Mars (or Sparrowhawk) models, produced the Mars VI, a two-bay biplane with Jaguar engine from which were developed the successful Grebe and Gamecock types.

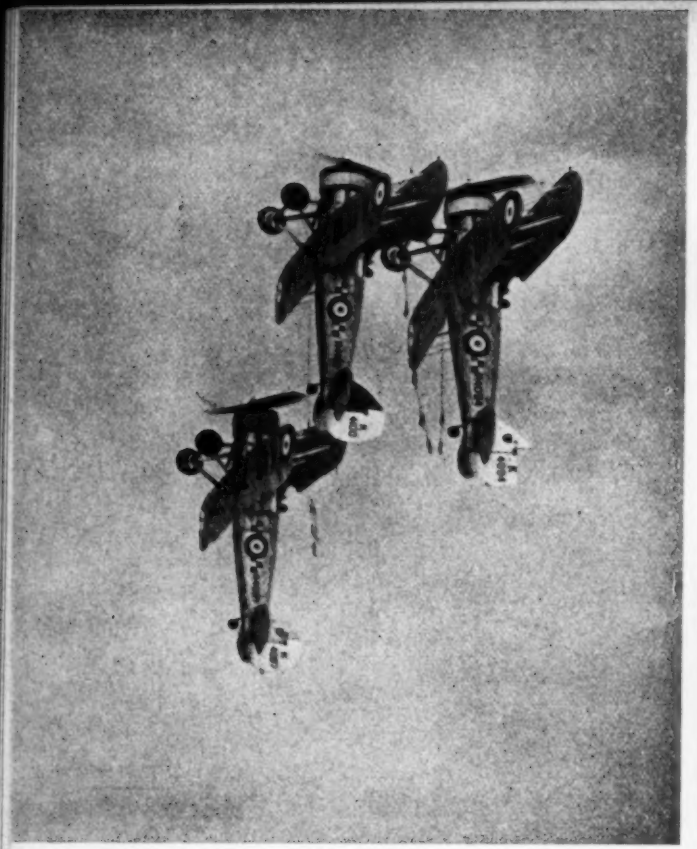
One interesting development of the 1923-4 period was the Bristol Fighter, basically similar to the warrior of earlier years, but mounting the 400 h.p. Jupiter which gave a speed of 133 m.p.h. The Fairey Flycatcher made its début in 1924 as a Fleet fighter, and, subsequently adopted, remained as the standard R.A.F. type in that category until the acceptance of the Hawker Nimrod about fifteen years later. Throughout its term of office the beloved old "'Catcher," remembered by display "fans" for its cacophonous assaults on tents and convoys, received surprisingly little modification. Like the Flycatcher, the contemporary Gloster Grebe mounted the Siddeley Jaguar two-row radial, but was planned for land service. Capable of 150 m.p.h., it was not long before the Grebe was "snapped up" as standard equipment. A competitor of the Flycatcher, the Parnall Plover, had a number of commendable features.

Profiting from their experience with the Silver Streak, an early experiment with duralumin construction, Shorts built the Springbok two-seater fighter for the Air Ministry, which proved of greater interest structurally than tactically.

As a matter of interest to those who regard Italy as the spiritual home of the single-seater fighter flying boat, we may mention the little Supermarine Sea Eagle amphibian, which reached the peak of its development about this time.

Originally christened the Ajax, an Armstrong-Whitworth two-seater fighter of 1925 was actually the prototype of the successful Atlas series of "A.C." and "G.P." biplanes

A standard fighter of not so long ago : the Jaguar-engined A.W. Siskin.

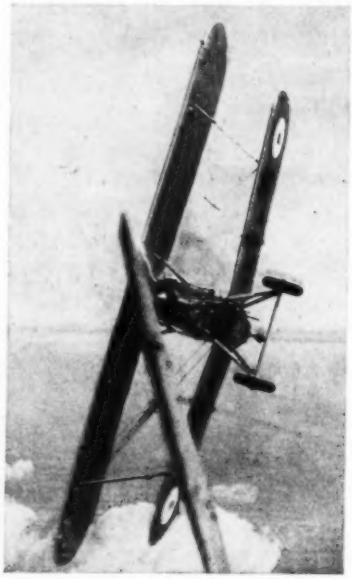


(Above) Formation aerobatics by a trio of the tractable Gloster Gauntlets now in service. (Right) Westland Wapiti general-purpose biplanes. (Centre) The Hind light bomber, a worthy representative of the Hawker series of two-seater biplanes.

later to prove their worth at home and abroad. Hawkers during the same year contributed their Woodcock, which was soon ordered in quantity by the Air Ministry as a night fighter.

By 1926 Glosters were turning out Jupiter-engined Gamecocks for the Service. The popularity of the type is exemplified by the persistence of the Gamecock until quite late years in Display aerobatics. It was, of course, a direct development of the Grebe, but was even stubbier and more agile.

It will have been gathered that air-cooled radials were popular for use in the fighters of the period, but the A.D.C. Martinsyde, built with an eye on the export market and having an excellent performance with a 330 h.p. water-cooled Nimbus engine, was not without recognition.



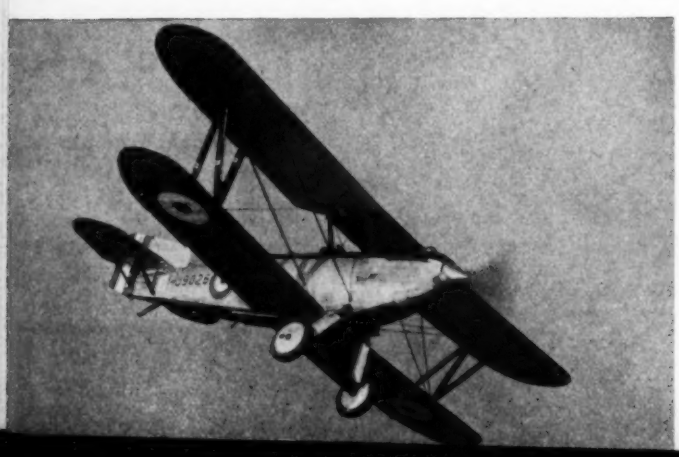
The Fairey Fox (below) showed how efficient a day-bomber could be made, due attention being paid to aerodynamic considerations.

To the order of the Latvian Government, Beardmores built an unorthodox square-cut two-seater fighter powered with a water-cooled Rolls-Royce Eagle engine of 360 h.p.

A trio of single-seaters, all with water-cooled engines, put up some outstanding performances during 1936. These were the Fairey Firefly with 430 h.p. Felix (Curtiss D.12) engine, the Gloster Gorcock (525 h.p. direct-drive Napier Lion), and Hawker Hornbill (650 h.p. direct-drive R.R. Condor). None was accepted for service, but all contributed to the store of knowledge which was eventually to permit the construction of the intercepters and day-and-night fighters of three or four years later. With air-cooled power plants, Hawkers built the Heron and Danecock, while, to the designs of M. Michel Wibault, Vickers turned out a number of all-metal single-seater parasol monoplanes for despatch to a foreign destination.

The introduction, in 1927, of the Jupiter-engined Bulldog capable of 170-180 m.p.h., gave us a fighter possessing a high performance while carrying a heavy military load, including wireless, sufficient fuel for useful patrol work, night-flying gear, etc. The Bulldog IIa has only lately been superseded as standard R.A.F. equipment.

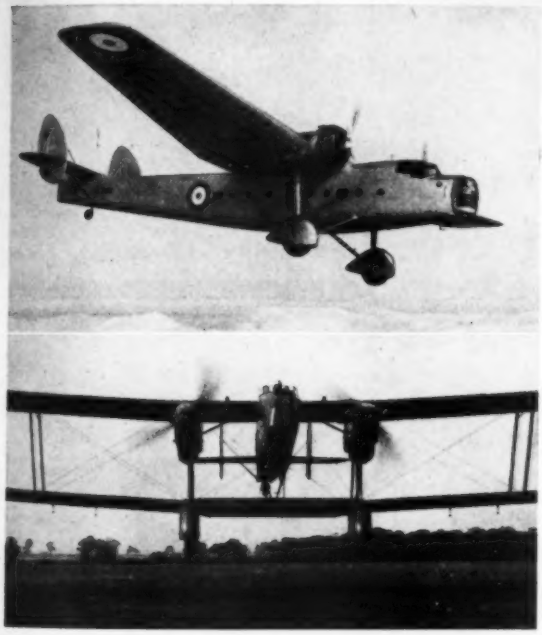
As a development of the Siskin, A.W.'s produced the Starling in 1928, while Avros improved on their Lion-engined Avenger of the previous year. Departing from the beaten track, Blackburns introduced their little Lynx-engined Lincock, the performance of which on only 200 h.p. was a real eye-opener. In competition with the Bulldog, Boulton and Pauls had their Partridge, Hawkers the Hawfinch and Glosters the Goldfinch, the last-named being on Gamecock lines. Glosters also fitted a special supercharged Lion into their Guan single-seater. Westlands put up the fascinating Wizard parasol monoplane



The twin-engined Boulton and Paul bombers have been almost unrivalled in their class on the score of manoeuvrability. This photograph was secured from a spinning Bourges soon after the war.

with Rolls-Royce "F" engine (Kestrel) obtaining nearly 190 m.p.h.

At the time of the Olympia Show in 1929 Great Britain had definitely established herself as the producer of the finest high-performance fighters. We had the Hawker Hornet (or Fury) and Fairey Firefly, with their ship-plane variations, the Gloster Gnat-snapper and Kestrel-engined models by Parnalls and Saunders Roe. Westlands were experimenting at that time with their low-wing intercepter, as were Vickers, who were



The Bristol Bombay (above) is a modern bomber transport accepted for service with the R.A.F. and the Handley Page Heyford (below) is a heavy bomber of earlier design, but still equipping several squadrons.

flying in addition an advanced biplane single-seater.

The period from 1930 to the present day has seen the advent of fighters which have so distinguished themselves as to render unnecessary within our limited space a review of their characteristics.

Two intercepters not already mentioned were the little Bullpup by Bristols and the De Havilland 77 with the first Napier-Halford H-shaped engine of the Rapier series. The Gloster S.S.18, originally an intercepter, was developed into the S.S.19 day-and-night fighter, then the S.S.19B four-gun machine, the Gauntlet, and eventually the Gladiator, a four-gun model now entering the Service.

From the original Hart day-bomber design was evolved the Demon two-seater fighter armed with three guns and carrying full day-and-night gear. The original Service Demon did about 185 m.p.h., whereas contemporary intercepters made about 210 m.p.h.

Armstrong Whitworths developed the Scimitar from the A.W. XVI. Unorthodox in design were three four-gun fighters of two or three years back—the Westland with a Goshawk engine in the fuselage, shaft-driven engine and pilot's cockpit ahead of the wings, the original "cranked-wing" Supermarine Spitfire and a Blackburn biplane to the same specification.

Indicative of the modern trend toward heavy armament for single-seaters was the Fairey Fantome with four machine guns and a shell-firing *canon* built to meet Belgian requirements. The Fantome was capable of over 250 m.p.h. As a matter of historical fact, the first "250 m.p.h. plus" fighter was a special version of the Hawker Fury.

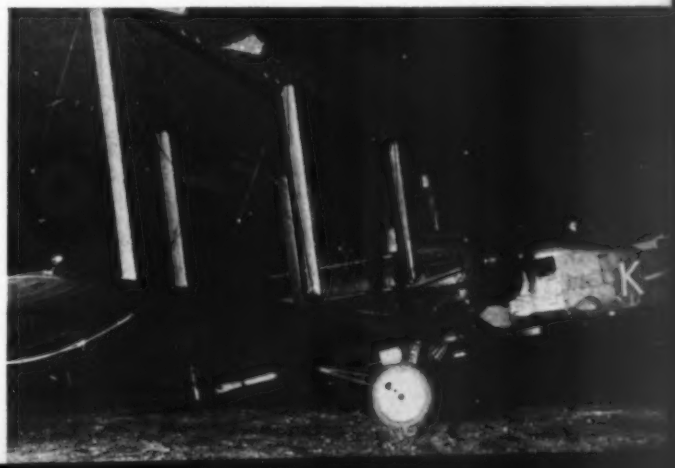
Our very newest fighters are the Hawker Hurricane and Supermarine Spitfire, both mounting the Rolls-Royce Merlin of over 1,000 h.p. and capable of more than 300 m.p.h., and the Vickers Venom fitted with a Bristol Aquila sleeve-valve radial. All these types are subjects of Air Ministry contracts and are probably the finest examples extant of the modern cantilever monoplane fighter with flaps, retractable undercarriage, cockpit enclosures and other up-to-date refinements.

Maids of All Work

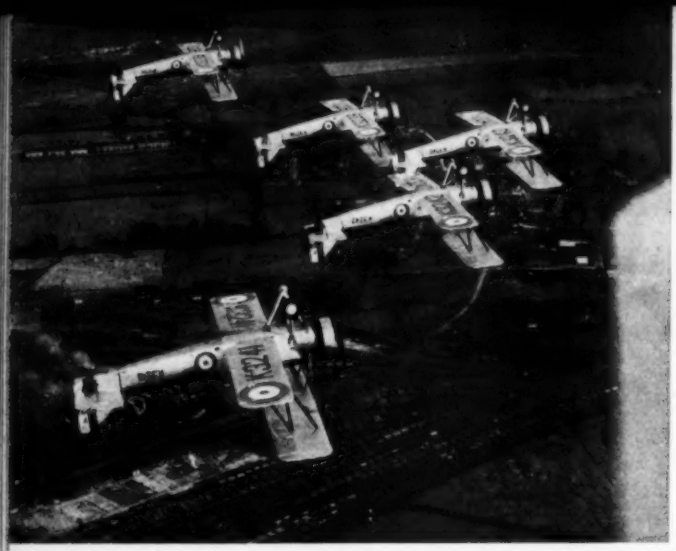
Single-engined Multi-seaters.—The multitude of light and (in certain cases, medium) bombers, army co-operation types and general purpose machines, being so similar in general conception during the period under review, may conveniently be considered under this heading, the two-seater fighters having already been dealt with, while the development of corresponding Fleet machines is traced in the appropriate section.

The versatile "Brisfit" and D.H.9a came in particularly useful after the war for general purposes, distinguishing themselves on foreign service.

Bristols put in a great deal of development work in post-war years on the "Fighter," even fitting it, as we have seen, with a Jupiter engine, but the Service knew it with the water-cooled Falcon. De Havillands, likewise, lost no time in developing the 9a and turned out a number of prototypes with many similar characteristics. The Bristol Badger was a single-bay two-seater with several advanced features. Faireys took full advantage of the qualities of their series "III" biplanes, developing a whole family of land- and floatplanes from which the



A direct descendant of the war-time Vimy, the Vickers Virginia heavy bomber has only lately been displaced.



Thanks very largely to the Avro concern the R.A.F. has always had first-class trainers. Tutors are seen above rehearsing inverted flying for an R.A.F. display.

Gordons and Seals are descended.

Foreshadowing the development of the widely used Atlas, the Armstrong Whitworth Wolf was built in 1923 as a "corps reconnaissance" type. Avros and Napiers collaborated in producing the highest-powered single-engined machine built up to the middle of 1924 (the Aldershot with 1,000 h.p. Cub engine), while Faireys submitted for official test, and received considerable orders for, the Fawn, a Lion-powered two-seater day-bomber type with the familiar unstaggered two-bay wings. A de Havilland offering in the same class was the D.H.38. Outstanding in its unconventionality, the Hawker Duiker corps reconnaissance machine was a parasol monoplane with swept-back wings and Jupiter engine. Taking advantage of the 650 h.p. offered by the Rolls-Royce Condor D.H.s constructed their big Derby bomber, a two-bay biplane with folding wings. Vickers put in some good work on their fast Vixen, Venture and Valparaiso types.

By 1925 Avros had developed the impressive Andover ambulance from the Aldershot, and Blackburns had made extensive tests with the Cubaroo, a three-bay giant built round a Napier Cub and intended for coastal defence. Rejoicing in the name Dingo, the D.H.42 appeared as a reconnaissance type with Jaguar engine.

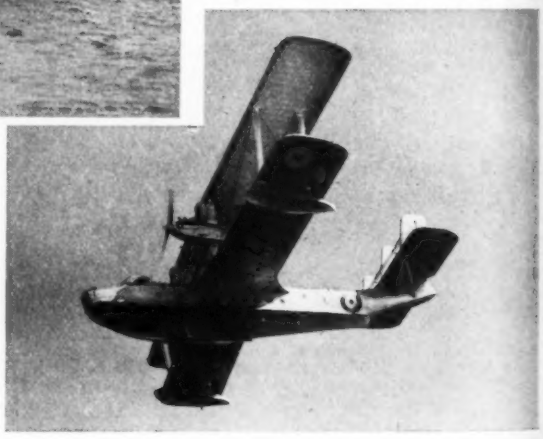
Bristols resorted to the extensive use of metal construction in their massive Berkeley bomber (Condor), and as an army co-operation model were testing the Jupiter-engined Boarhound.

The most noteworthy two-seater of 1926 was the Fairey Fox high-speed bomber incorporating a number of American ideas and mounting the Fairey Felix water-cooled engine—the Curtiss D.12 built under licence. The Fox subsequently showed a speed of about 150 m.p.h. Improving on the Dingo, D.H.s completed the Hyena with 385 h.p. Jaguar. Destined for a long period of useful Service employment as a bomber and torpedo-plane the Condor-powered Hawker Horsley caused something of a sensation at this period by virtue of its all-round efficiency. In keeping with the vogue for very large single-engined bombers Handley Pages contributed the Handcross, fitted, like many of its contemporary competitors, with Rolls-Royce Condor. Vickers "struck lucky" with the Vespa biplane which subsequently sold well, and Westlands added the Yeovil to the already impressive list of Condor-engined bombers.

In 1927 the A.W. Atlas was in large-scale production as the standard army co-operation machine. The trend toward general-purpose aircraft of good performance and great versatility was marked by the Bristol Beaver, the Fairey IIIF, the Gloster Goral and Goring, the Vickers Valiant and the Westland Wapiti. De Havillands, in the Hound with special Lion engine, had probably the fastest military two-seater in the world.

Between 1927 and 1929 a great deal of development work was under way, resulting in the high-performance two-seaters of recent years. Faireys installed a Kestrel in a Fox, D.H.s put one of the then-new geared Jupiters in a Hound, and Vickers tried the Lion-engined Vivid.

The 1929 crop of high-speed bombers included the Avro Antelope, Hawker Hart and Fairey metal Fox, all taking advantage of the excellent qualities of the Kestrel engine and putting up speeds in the 170-180 m.p.h. region with war load, including 500lb. of bombs. Faireys turned out a Jaguar-engined version of the IIIF which foreshadowed the Panther-engined Gordon still in service, and the Hawker Horsley was selected as a flying test bed for the Siddeley Leopard. Handley Pages gained some useful data with their Hare day bombers, and Vickers, with the original Vildebeest, were smoothing the way for the large numbers of machines of this type (including Vincents) in service to-day. Westlands varied the Wapiti theme and completed the Witch parasol monoplane day bomber. Bristols with their 118 and 120 g.p. types departed somewhat from the beaten track.



The central photograph shows a Blackburn Ripon releasing a torpedo, while that below is of a Singapore III flying boat of the type which now forms the equipment of a number of R.A.F. units.

By 1932 Westlands had developed the Wapiti into the Wallace and Hawkers were busy on Hart variations.

Handley Pages, with their G.P. machine of 1935, showed how careful aerodynamic design and the incorporation of slots and flaps could benefit performance, while to meet the same requirements Vickers produced the G.4/31 biplane and the fully geodetic Wellesley, now in production; other G.P. types were submitted by Blackburns, Hawkers, Parnalls, Faireys and Westlands. A number of Rotas (Autogiros) were ordered for Army co-operation.

Machines on test or in production to-day are the Fairey Battle and P.4/34, a Hawker to the latter specification (all cantilever monoplanes with Merlin engine), the Armstrong Whitworth medium bomber and the Westland Lysander with its advanced installation of slots and flaps.

Multi-engined Landplanes.—The big bombers of early post-war years were, generally speaking, of creditably ad-

vanced conception, and although mainly along twin-engined biplane lines were by no means stereotyped in design, as witness the Bristol Braemar triplane. The Boulton and Paul Bourges (not entirely of post-War conception) was outstanding, like its more modern developments, for exceptional manœuvrability. The Boulton, on somewhat similar lines, was an early attempt at steel construction. Armstrong Whitworths were soon in the heavy bomber field with the Sinaia with a pair of Tiger engines (not the VIIIs or IXs of the modern Whitley, but early water-cooled units) and gun rings in the nacelles.

By 1923 Vickers had their Virginia and Vanguard types under development. Both these machines, in improved forms, were destined for long and meritorious service with the R.A.F.

B.P. and H.P.

The Boulton and Paul Bugle flying in 1928 showed a number of features preserved in the Sidestrand and Overstrand models later officially adopted, while the Handley Page Hyderabad was similar to the W.8 passenger carrier, and was the precursor of the Hinaidi and Clive subsequently designed. A contemporary of the Hinaidi (1926-27) was the formidable Sidestrand, the first machine to be adopted as a twin-engined day bomber, and later to become the first of the medium bombers as we know them to-day.

Since the days of the Sidestrand and Hinaidi we have seen two Vickers biplanes, one with two and the other with four Kestrels, the Gloster troop carrier, also with two pairs of Kestrels, the Handley Page Heyford and Fairey Hendon (both twin-Kestrel types accepted for service), and a large triple-engined (Pegasus) effort by Boulton Pauls. During the past two years Armstrong Whitworths have produced the A.W.23 bomber transport and the Whitley bomber (both Tiger-engined low-wing cantilever monoplanes), orders have been placed for the Bristol bomber transport (two Pegasus), and Blenheim high-speed medium bomber with Mercuries, while medium bombers of brilliant performance, somewhat larger than the Blenheim, have been built by, and ordered from Handley Pages and Vickers under the names Hampden and Wellington. Large batches of Harrow heavy bombers (developed from a bomber-transport design) are being delivered by Handley Pages. Speeds of over 250 m.p.h. are becoming common and armament is being revised.

A recent twin-engined machine to enter the Service is the Avro Anson coastal and general reconnaissance monoplane, recalling (though not in design) the Avro Ava coastal defence machine of many years back.

Seafarers

Fleet and Marine Types.—Ship planes and shore-based aircraft for operation over water may conveniently be considered under a common heading, although the latter include large flying boats and the former may be regarded as modified landplanes.

Post-war flying boats were largely direct developments of Wartime craft, as exemplified by the Short Cromarty and the Fairey and Gosport types. The Supermarine efforts were largely on the civil side, although the Sea Lion (forerunner of the Sea King already mentioned) represented an early attempt at a single-seater fighter flying boat. It did nearly 150 m.p.h. with a Napier Lion. By 1922 Faireys had developed a number of floatplane amphibians with fixed and retractable wheels. Parnalls had the central-float Puffin and were in production with the folding-fuselage Panther ship plane. The Supermarine Seal and the later Seagull were, in effect, the precursors of our present-day fleet-spotter Walrus, but had tractor airscrews. Incidentally, in 1921-22 Westlands gave the name Walrus to their fleet-spotter modification of the D.H.9a.

The Blackburn Swifts and Darts of this period paved the way for the Ripon, Baffin and Shark torpedo carriers, and the Blackburn fleet spotter, like the types already mentioned, was adopted for service.

Faireys had the N.4, or Atalanta, four-Condor flying boat in the air by 1923. Its engines were disposed of in the same fashion as those in the Short Singapore III of to-day. The Fairey Flycatcher and Parnall Plover fleet fighters have already been mentioned in the section dealing with fighters. A notable Vickers flying boat was the Valentia, which made 105 m.p.h. with two Condors at a weight of 21,300 lb.

As a fleet spotter Avros built the Bison, a commodious deck-landing biplane, while Blackburn's contemporary development in the torpedo-carrying category was the Velos. The Supermarine Southampton—one of the most outstanding military flying boats ever built—appeared in 1925. Original flying boat prototypes were constructed by the English Electric Co.

Handley Pages, by 1926, had applied their experience with slots to their Hendon torpedo carrier, and in the following year Blackburns were testing a three-seater fleet-spotter monoplane, particularly interesting in view of the recent introduction of the same company's dive-bomber fighter—likewise a deck-landing monoplane. An ambitious effort was the Saunders Valkyrie flying boat with three Condor engines. Shorts obviously aimed at improved performance with their Singapore I Condor-engined flying boat, which provided data leading to the construction of the Singapore III (four Kestrels) in service to-day. A metal-hulled version of the Supermarine Southampton was taken into the Service.

Torpedo Carriers

Representing a great advance in the design of torpedo carriers the Blackburn Ripon appeared, eventually to be developed into the Baffin. At the time of its introduction Faireys were building deck-landing versions of the popular IIIF, which subsequently evolved into the Seal. The contemporary Handley Page Harrow was a Lion-engined torpedo-bomber. The Pike, by Parnalls, and the Short Sturgeon were fleet-spotters of more than usual interest, and the little Vickers Vireo fleet fighter monoplane foreshadowed a modern trend.

Nineteen twenty-nine saw the adoption of the triple-Condor Blackburn Iris flying boat and the introduction of the Sydney monoplane with three Kestrels. Hawkers and Faireys built fast single- and two-seaters for carrier operation, the Hawker types evolving into the Nimrod and Osprey as we know them to-day. In the fleet-fighter-reconnaissance competition were the Blackburn Nautilus and Short Gurnard; the Gloster Gnatsnapper, Fairey Firefly III and A.W.XVI were rivals of the Nimrod.

Experimental developments of 1930-31 were the metal Ripon and the Nautilus torpedo machines by Blackburn, and the same firm's installation of three Leopards (one as a pusher) in an Iris. The Saunders Roe A.7 (three Jupiters) had a number of features in common with the London as we know it now, while the Cloud amphibian lent itself admirably to navigational instruction. A four-engined Singapore and a three-engined Southampton were flying at this time.

A Six-engined Short

Since 1931 we have seen experimental torpedo bombers mounting the Rolls-Royce Buzzard (specification M.1/30); the Perth flying boat developed from the Iris; the production of the great six-Buzzard Short Sarafand; the entry into and passing from, the service of the Short Rangoon and the large-scale production of the Singapore; the adoption of the twin-engined Supermarine Scapa and Stranraer, the Saro London and the Walrus amphibian; the issue of Blackburn Shark and Swordfish torpedo-spotter-reconnaissance biplanes and Fairey Seal fleet spotters to the Fleet Air Arm; and the completion of the Blackburn dive-bomber fleet fighter monoplane and Rapier-engined Fairey light reconnaissance seaplane prototypes.

A number of experimental Fleet machines should be taking the air before long.

THE CIVIL SIDE

1911-1937—*Section III : The Development of Commercial and Private Aircraft Since the War*

OF the trials and tribulations through which the aircraft industry passed during the years following the War there is no space to write in a review of technical development. The R.A.F. was reduced almost to vanishing point; civil aviation had not yet started, and the enormous war-time stock of aircraft, which was ultimately sold to a company which afterwards became known as the Aircraft Disposal Co., resulted in orders from the Government being few and far between. All the more honour, therefore, to those firms which backed their faith in the ultimate greatness of "The Air" by hard cash, and carried on in the face of almost incredible difficulties.

It may be said that before the War there was, to all intents and purposes, no military aviation; that during the War there was nothing but military aviation; and that after the War the civil and military sides began to diverge, almost imperceptibly at first, and then more and more. The post-War military development is dealt with elsewhere in this issue. Here we are concerned with the civil side only, which may conveniently be divided into commercial aviation and private flying.

That there were people in England who foresaw a great future for commercial aviation as soon as the War should be over was proved by the announcement which appeared in *Flight* of November 21, 1918, only ten days after the signing of the Armistice, of the registration of a company under the title Aircraft Transport and Travel, Ltd. The moving spirit was Mr. G. Holt Thomas, managing director of the Aircraft Manufacturing Co., Ltd. Naturally it took some little time to get started as military aeroplanes had to be converted for civil use, and it was not until August, 1919, that the proposed London-Paris air service could be opened. On August 25, 1919, an Airco or D.H.4, modified by having a "lid" with transparent windows placed over what had been the gunner's cockpit, made the first of a series of regular daily flights from Hounslow, London, to Le Bourget. It was piloted by Lieut. E. H. Lawford, now C.O. at Lympne, and made the journey in 2½ hours. Handley Page, Ltd., started a parallel service a week later, their machines running on alternate days. The type of aircraft used was a slightly modified H.P. 0/400 night bomber. During the next few years the London-Paris and other air services were operated in spite of many difficulties. The ground organisation was of the sketchiest, wireless was in its infancy, and meteorological information was not readily available as it is now. That these early services to Paris, Brussels and elsewhere were nevertheless run with fairly good regularity and safety must be to the everlasting credit of the pilots, to whom a special medal ought to be struck.

After a time, A.T. and T. and Handley Page, Ltd., were joined by other operating companies, notably Instone Air Lines and Daimler Hire. Competition for traffic, which was, in any case, not very plentiful, became so severe that some sort of change had to be made, and in 1924 Imperial Airways, Ltd., was formed and absorbed the then existing companies. The Government agreed to subsidise this company on a gradually diminishing scale so that after a certain number of years it might become self-supporting, and there we must leave the subject of commercial aviation (some other historical notes on which appear on pages 452-453) to take up the story of how the commercial aeroplane, as we know it to-day, has developed from the Airco 4s and 9s and Handley-Pages of 1918-19. This story can best be told by taking the firms whose machines have done most of our commercial work and tracing the gradual evolution from type to type. Many others produced commercial aircraft types from time to time, but as they did not markedly affect development, and did not go into service in large numbers, they must be omitted here from considerations of space.

Early Commercial Types

The Aircraft Manufacturing Co., Ltd., began commercial aviation in this country, and it is, perhaps, significant that the modern descendant of the Airco, the De Havilland Aircraft Co., Ltd., has produced more civil aircraft types than any other firm in the country. Apart from the converted D.H.4s and 9s, the first commercial type was the D.H.16, which was a development of the earlier types but modified to carry pilot and four passengers. The pilot sat in front, in an open cockpit just behind the 350 h.p. Rolls-Royce Eagle engine. This arrangement was retained in such subsequent types as the 32 and 34, but in the D.H.18 and 50 types the pilot was seated aft of the cabin.

The D.H.18 was fitted with the 450 h.p. Napier Lion engine and carried eight passengers. It was followed by the D.H.32, which also carried eight passengers.

With the D.H.34 Capt. G. de Havilland reached what was probably the maximum of wing loading for an aeroplane not fitted with high-lift devices such as modern split flaps or slots. It was not high compared with modern standards—the figure was 10.5 lb./sq. ft.—but the power loading which accompanied it was 13.8 lb./h.p., and there were those who shook their heads at such ratios. However, the machine did very good service and was fairly economical to operate, as it carried nine passengers with a Napier Lion engine of 450 h.p. at a cruising speed of about 105 m.p.h.

An early British passenger-carrier was the Vimy Commercial. In addition to those used in this country a large number was sold abroad, including 40 to China.

One of the most popular commercial aeroplanes of its day (1922) was the De Havilland D.H.34 with Napier Lion engine

In 1926 the De Havilland Company produced their first civil multi-engined aeroplane, the type D.H.66 "Hercules." With three Bristol Jupiter engines this machine carried fourteen passengers at a cruising speed of 110 m.p.h., and with one engine stopped it could carry on at 95 m.p.h. The type gave very good service, and it is believed that one is still in use in South Africa.

The next De Havilland multi-engined machine came along in 1932, and was designed specially to fulfil the requirements of the late Mr. Edward Hillman, whose aim was to bring airline travel within reach of the masses. Called the Dragon, it bore the series numbers D.H.84, and was a very remarkable aeroplane in that with two Gipsy Major engines of 130 h.p. each it carried up to eight passengers at about 110 m.p.h. cruising speed. The Dragon was, in its day, the most efficient small commercial aeroplane built.

In the D.H.86, or Express, the De Havilland Company produced their first four-engined commercial aeroplane. The type is now in extensive use, and nothing need be said about it, as it is well known in many parts of the world. The same remarks apply to the D.H.89, or Rapide, which may be described as a smaller twin-engined version of the D.H.86, or, alternatively, as an improved and faster Dragon.

Of the very latest commercial D.H. type little may be disclosed at the moment. A photograph will be found on page 439, from which it will be seen that the D.H. Albatross might be described as a scaled-up "Comet" with four engines. No performance figures are available, and to speculate as the Press has been doing lately is rather futile.

The first Handley Page commercial aeroplane was the W.8, built in 1919. At one time this machine held the world's height record with 14,000ft., carrying a load of 3,690 lb. With two Napier Lion engines of 450 h.p. each it was designed to carry 15 passengers. Entered in the competition for commercial aeroplanes organised by the Air Ministry in 1920, the W.8 received the first prize in the large class.

The Handley Page W.10 was a 14-passenger biplane with two Napier Lions, and had a cruising speed of about 100 m.p.h. It was generally similar to the W.8 and still showed traces of its ancestry common with that of the O/400 night bomber.

In the H.P.42 a complete breakaway from previous "lines" took place. The *Hannibal*, as the first of the class was called, is a biplane with a very unusual arrangement of its four Bristol Jupiter engines, two of which are placed outboard on the lower wings, while the other two are suspended, rather closer together, under the top centre-section. The 42 carries up to forty passengers in great comfort, the number depending upon the flying range used. It has served Imperial Airways well for many years, but, with its cruising speed of about 105 m.p.h., is getting a little too slow for modern times.

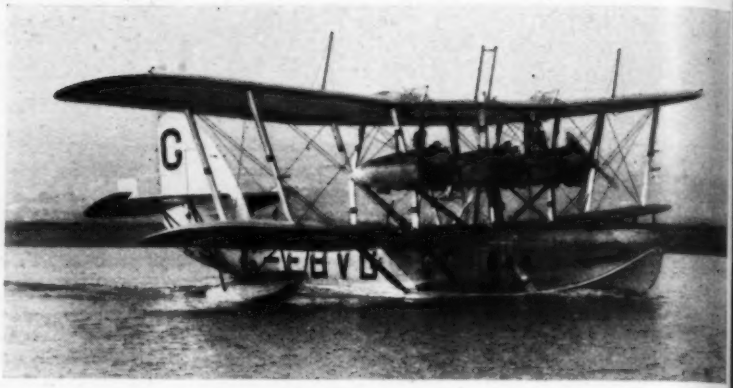
The first large commercial aeroplane to be supplied by Sir W. G. Armstrong Whitworth to Imperial Airways was the Argosy type. Fitted with three Armstrong Siddeley Jaguar engines of 385 h.p. each, that machine had accommodation for twenty passengers, and it carried them at a cruising speed of about 95 m.p.h. It was in its day (1926) considered a very economical aircraft to operate, and gave excellent service. Compared with modern standards, its comfort was not of a high order, and the engine in the nose of the fuselage tended to increase the noise in the cabin.

In 1931 was produced the Armstrong Whitworth A.W.XV Atalanta. This machine is an all-metal high-wing monoplane powered by four Armstrong Siddeley Serval engines of 340 h.p. each, mounted in line along the leading edge of the monoplane wing. The machine was originally designed to carry nine passengers only, as it was intended to carry a very large mail load as well. Its cruising speed is 130 m.p.h., and machines of its class are still in use on certain routes of Imperial Airways.

Now on order for Imperial Airways are a number of new landplanes of the A.W.27 or *Ensign* type. This will be a four-engined high-wing monoplane, driven by four Armstrong Siddeley Tiger engines of 800 h.p. each. Comfortable accommodation will be provided for twenty-seven passengers in the daytime and for twenty at night. The cruising speed will be about 160 m.p.h.

With the exception of the *Scylla* class, a landplane conversion of the Kent flying boat, all the types contributed

The Handley Page W.8 of 1919 showed traces of its O/400 parentage. The engines were Rolls-Royce Eagles of 350 h.p. each



First commercial flying boat to be adopted by Imperial Airways was the Short Calcutta, with three Bristol Jupiter engines.

by Short Brothers, of Rochester, to the Empire air routes have been flying boats. The first type was the Calcutta, which made its appearance in 1927, and has been in service until quite recently, when it was turned into a training machine for flying-boat pilots. The Calcutta is a biplane flying boat of all-metal construction, powered by three Bristol Jupiters of 525 h.p. each. In the hull there is accommodation for fifteen passengers. The cruising speed is 93 m.p.h.

The Short Kent was designed to meet a specification issued by Imperial Airways. Carrying the same number of passengers as the Calcutta, the Kent or *Scipio* class is vastly more comfortable, with spacious cabins and adequate sound proofing. It has done excellent service on the Mediterranean section of the Empire route, and was popular with pilots and passengers alike.

The latest type of Short flying boat, the Empire type, is of recent production and is, therefore, well known to *Flight* readers. Twenty-nine of these boats have been ordered by Imperial Airways. The Empire type is an exceptionally "clean" high-wing monoplane flying boat with four Bristol Pegasus engines. Extremely luxurious accommodation is provided for twenty-four passengers in the daytime and sixteen passengers at night. The Empire boat has a cruising speed of 160 m.p.h.

PRIVATE TYPES

Alongside the development of large commercial aircraft during the post-war period there occurred an amazing flood of small civil aeroplanes intended for the private owner. The stimulus was provided first by the competitions held at Lympne in 1923 and 1924, and later by the introduction, by the De Havilland Company, of the first Moth in 1925.

No fewer than 28 machines were entered for the Lympne competition of 1923, which was for single-seaters. The machines were fitted with motor cycle engines, which proved very unreliable. Two machines tied for the first prize by covering 87.5 miles per gallon of petrol. The machines were the A.N.E.C. monoplane piloted by "Jimmie" James, and the English Electric Co.'s Wren, piloted by Flt. Lt. Longton. Capt. Norman Macmillan won the speed prize on a Parnall Pixie by reaching 76.1 m.p.h., and the altitude competition was won by the A.N.E.C. monoplane with a height of 14,400ft. Bert Hinkler received a prize for flying 1,000 miles during the meeting on an Avro monoplane.

The following year a somewhat similar competition was held, but this time for two-seaters. Nineteen machines were entered, the following firms being represented: Wm. Beardmore, Bristols, A.N.E.C., Blackburn, Hawker, Parnall, Avro, Shorts, Supermarines, and Westlands.

Marks were awarded for speed range, take-off and pull-up, and prizes were also awarded for the number of miles flown during the meeting. The first prize, offered by the Air Ministry, was won by a Beardmore Wee Bee monoplane with Bristol Cherub engine of 34 h.p. Second place went to a Bristol Brownie, also with Cherub engine.

None of the machines which took part in the competition were put into production, mainly because the engines were not very reliable, but also because, to enable them to carry two people on the low power of the engines, very flimsy construction was necessary; this would hardly have been satisfactory in the hands of anyone but an expert pilot.

It can be said that the real beginning of private flying did not come about as a direct result of the Lympne trials but followed the introduction, in 1925, of the D.H.60 "Moth." De Havillands did not take part in the Lympne competitions, but, instead, produced what they considered was the type of aeroplane which would appeal to the private owner. Subsequent history proved them right, and the "Moth" proved to be the first of a long series of light aeroplanes, not only by the De Havilland Company but by many other firms. The D.H.60 had a 60 h.p. Cirrus four-cylinder, air-cooled engine, and carried pilot and one passenger. The original machine weighed 764 lb. empty and about 1,250 lb. loaded. As time went on, the type was strengthened here and there, more equipment was carried and more powerful engines fitted, until the machine began to be rather far removed from the "light" class.

From the original Moth was developed a remarkable series of De Havilland aircraft types suitable for the private owner, of which it will suffice to mention the Tiger Moth, Puss Moth, Fox Moth, Leopard Moth and Hornet Moth, all of which have won fame the world over.

Post-war Constructors

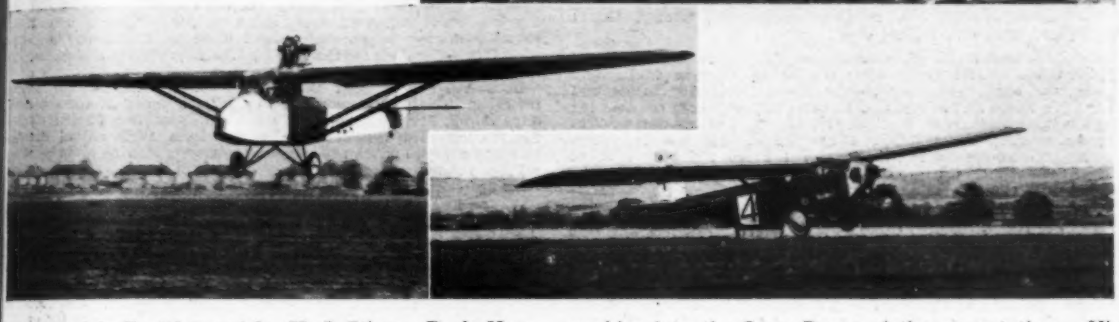
Since the War a large number of aircraft firms have come into existence, but as their history is of relatively recent date it may be assumed that *Flight* readers are familiar with the types, so that a very brief mention will suffice.

Airspeed, Ltd., was founded by Mr. J. S. Norway and A. H. Tiltman at York in 1932. The first machine to be built was the Ferry, a three-engined biplane of unusual design and great carrying capacity. Next came the Courier, which was the first British civil low-wing monoplane with retractable undercarriage. This was followed, when the company had extended and transferred to Portsmouth, by the Envoy, a very clean twin-engined, low-wing monoplane with flaps and retractable undercarriage.

The British Aircraft Manufacturing Co., Ltd., of Hanworth, was formed in 1935, after making a start as the British Klemm Aeroplane Co., Ltd. At first monoplanes of Klemm design were built, but soon the firm turned to original design, Mr. G. H. Handasyde having joined them. Up to the present three types have been produced, the little two-seater Swallow, the Eagle cabin monoplane, and the Double Eagle, a larger twin-engined cabin machine. When Mr. Handasyde transferred to British Marine Aircraft, Ltd., Mr. M. Langley was put in charge of design.

The Cierva Autogiro Co., Ltd., of Hanworth, has the distinction of having introduced rotating-wing aircraft to Great Britain. Senor de la Cierva came to England with his first machine in 1925, and the following year the company was formed, largely with the financial aid of Air-Commodore J. G. Weir. Consistent development followed, and the Autogiro has now reached the stage when "jump-starts" are possible. Air-Commodore Weir began experiments at Glasgow last year with a small single-seater, with which some very interesting results were obtained.

General Aircraft, Ltd., of Hanworth, was formed as a private company early in 1931 to take over the monospar



Makers of light plane history. On the right the first D.H. 60 Moth, G-EBKT, with 60 h.p. Cirrus engine. This machine was De Havilland's interpretation of what a light aeroplane should be like. The machine was produced in 1925. The lower right-hand picture shows the Beardmore Wee Bee which won the Lympne light plane competition in 1924. The first attempt to revive interest in the "ultra light" was the Lowe-Wylde (now Kronfeld) Drone, seen below.

patents originally taken out by H. J. Stieger, R. de Haga Haig and A. E. L. Chorlton. These patents covered an interesting form of wing construction. In 1934 the company was floated as a public company. Mr. E. C. Gordon England, one of our pioneer designers and pilots, is managing director. The monospar types produced by General Aircraft are well known, the most recent being the S.T.25 Jubilee type, with two Pobjoy engines, and the Croydon commercial monoplane.

The Gloster Aircraft Co., Ltd., is, strictly speaking, not a post-War firm, having been "born" in 1917, when Bristol Fighters were built. However, original design was not undertaken until Mr. H. P. Folland joined the firm as chief designer. The first Gloster machines showed strong family resemblance to the S.E.5 and British Nieuports, as was natural in view of Mr. Folland's connection with these machines.

Then followed a long line of single-seater fighters, most of which went into service for many years in the R.A.F. The most recent types are the Gauntlet and Gladiator. The firm, which is now one of the Hawker-Siddeley group, has also pursued a vigorous racing policy and produced such machines as the "Bamel," and several Gloster challengers for the Schneider trophy. Chief designer of the firm is now Mr. W. G. Carter, who some years ago was Hawker's chief designer.

From the Ashes

The Heston Aircraft Co., Ltd., started its career as the Comper Aircraft Co. in 1929, when the factory was at Hooton, Cheshire. In 1933 the company moved to Heston, and in 1934 Flt. Lt. Comper resigned and the name of the firm was changed to the present one. The Comper Swift single-seater will be familiar to all. The most recent type is the Heston Phœnix, a small strut-braced monoplane remarkable for the quiet of its cabin. Mr. G. Cornwall is chief designer.

After the failure of the Lympne competitions to produce really practical light aircraft, a period followed during which no one thought it worth while to build machines of this type. Then, in 1932, Mr. Lowe-Wylde decided to produce a glider fitted with a motor cycle engine. The machine flew quite well, and Mr. Lowe-Wylde persevered until his death. Some time after, the designs and goodwill were taken over by Mr. Robert Kronfeld, the famous Austrian glider pilot, who has further developed the machine into the Super-Drone of the present time. His company is now called Kronfeld, Ltd., and has headquarters at Hanworth.

Capt. Edgar W. Percival came to England a good many years ago after a distinguished career as a commercial pilot in Australia. His series of Gull monoplanes, followed by Mew Gulls and Vega Gulls, have won golden opinions for their high performance for a modest power output, and are among the most efficient of their class in the world. The first examples were built by Parnall, of Yate, but later Capt. Percival established his own works at Gravesend, and recently he has transferred the works to Luton Airport.

Falconry

Regarded by many as one of the most brilliant of our young designers, Mr. F. G. Miles joined Phillips and Powis Aircraft, Ltd., in 1935. The company itself started at Reading in a very small way, in 1929, with one small hangar, one pilot and one ground engineer. However, Mr. Charles Powis, the founder of the firm, foresaw a bright future for small aircraft, and the series of Hawks, Falcons, Sparrowhawks and Nighthawks will be familiar to all *Flight* readers. The most recent type is the Miles Whitney Straight, which is held to have outstanding flying qualities.

Pobjoy Airmotors and Aircraft, Ltd., began as engine designers in 1930, and it was not until 1935 that aircraft was incorporated both in the title of the firm and in its programme, which now includes, in addition to the design and manufacture of aero engines, the building of the Short Scion aeroplane. Capt. Ian Maxwell has been associated with Mr. D. R. Pobjoy for a number of years, and Mr. Oswald Short and Mr. Arthur Gouge are on the board of directors. The factory is at Rochester Airport.

Scottish Aircraft and Engineering Co., Ltd., was founded last year to build the American Burnelli in this country under licence. So far no machine has been completed. The works are at Willesden.

Tipsy Aircraft handles the little Tipsy monoplane single-seater in this country. The machine was designed by Mr. Tipps, of *Avions Fairey*, at Gosselies, Belgium, and is now manufactured in this country. Enquiries should be addressed to Tipsy Aircraft, at North Hyde Road, Hayes, Middlesex, where, of course, the Fairey offices are also situated.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS — AIR MINISTRY ANNOUNCEMENTS

HIGHER APPOINTMENT

The Air Ministry announces that Air Vice-Marshal Henry Meyrick Cave-Browne-Cave, C.B., D.S.O., D.F.C., is to be Air Officer Commanding, No. 16 (Reconnaissance) Group, Royal Air Force, with effect from April 27.

Air Vice-Marshal H. M. Cave-Browne-Cave joined the Royal Flying Corps (Naval Wing) from the Royal Navy in April, 1914. During the war he served with the Royal Naval Air Service and Royal Air Force and in addition to other appointments commanded the Seaplane Stations at Dunkirk and Malta. For his war services he was awarded the D.S.O. and the D.F.C. He was granted a permanent commission in the Royal Air Force with the rank of Wing Commander in 1919 and later served on the staff of the School of Technical Training (Apprentices) Royal Air Force. During 1922-7 he held, in turn, the posts of Deputy Director of Design and Deputy Director of Technical Development at the Air Ministry.

He was in command of the Far East Flight which left England in October, 1927, for Singapore and afterwards flew from Singapore round Australia back to Singapore and from Singapore to Hong Kong and back—a total distance of more than 27,000 statute miles. On the formation of the Far East Command, with Headquarters at Singapore, he was appointed Commanding Officer. In April, 1931, he was posted to the Air Ministry as Director of Technical Development, and in December, 1934, he became Air Officer Commanding, Royal Air Force, Cranwell, and Commandant of the Royal Air Force College.

In the New Year Honours, 1936, Air Vice-Marshal Cave-Browne-Cave was appointed a Companion of the Order of the Bath. He was promoted to Group Captain in 1926, to Air Commodore in 1931, and was granted his present rank of Air Vice-Marshal in 1935.

THE CORONATION

Certain members of the Territorial, Auxiliary and Reserve forces have volunteered and have been selected for inclusion in the representative contingents participating in the Coronation celebrations in London. Any civilian employed under the Air Ministry who has been so selected may be granted special leave with civil pay for any period of attendance authorised by the appropriate authorities, in addition to the public holiday.

Invitations have been issued to a limited number of naval reservists to volunteer for naval service for a period of about twelve days during May in connection with the Coronation Review of the Fleet. Provided they can be spared from their official duties, civilians who are naval pensioners or reservists may be given permission to volunteer for this service, which will be regarded as annual training.

FLYING ACCIDENTS

The Air Ministry regrets to announce that as the result of a collision in the air which occurred at Methwold, Hithe, Suffolk, on April 29, between two aircraft of No. 214 (Bomber) Squadron, Feltwell, the undermentioned personnel lost their lives: F/O. John Joseph McCarthy, P/O. Wilfred Lawrence Warner, Sgt. James Murray Macdonald, A/C.1 John George Simpson, and A/C.1 Thomas Garside F/O. McCarthy and P/O. Warner were the pilots of their respective aircraft.

The Ministry also regrets to announce that Sgt. Harry Frederick Croft lost his life as the result of a collision in the air which occurred at Droxford, near Bishops Waltham, on April 30, between three aircraft of No. 800 (Fleet Fighter) Squadron, Southampton. Sgt. Croft was the pilot and sole occupant of one aircraft. The pilots and sole occupants of the other two aircraft, Flt. Lt. James Winter Carmichael More and Sgt. Hugh Philip Hopkins, were not injured.

ROYAL AIR FORCE GAZETTE

London Gazette, April 27, 1937

General Duties Branch

D. S. Thom is granted a short service commission as Acting Pilot Officer on probation with effect from and with seniority of April 13.

The following Acting Pilot Officers on probation are confirmed in their appointments and graded as Pilot Officers on the dates stated:—W. R. Gardiner (December 24, 1936); P. A. Burnell-Phillips, W. H. Cheetham, S. F. Coutts-Wood, C. A. R. Crews, E. A. Hunt, R. C. O. Lovelock, P. D. F. Mitchell, J. R. Pennington-Legh, F. Phillips, A. G. Wincott (March 9); P. H. Alington, W. M. H. Brookes, L. G. Burnand, J. R. D. Hird, D. E. Hughes, F. R. Jamieson, M. L. Morris, R. C. Porteous, L. H. Schwind, J. St. J. Thomson, J. B. Wray (March 23).

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—H. B. Hurley (March 15); T. G. Young (March 29); H. V. Kennedy, W. G. Devas, E. L. A. Walter, D. W. H. Gardner (April 2); I. H. D. Walker, E. T. Smith (April 9); L. V. Spencer (April 15).

The following Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—K. C. Gill (March 14); C. Fothergill, A. Flowerdew (March 24); W. G. Wells, J. B. Voyce, C. H. Mitchell, J. C. Millar, E. T. T. Nelson, T. G. W. Appleby, C. A. Wood, A. N. Cole, A. S. Downes, W. A. L. Locker, D. C. Smith, J. J. Raine, J. P. Marriott, J. Mercer (April 14); F. Holman (April 16); G. R. H. Black (April 24).

Flt. Lt. J. G. W. Weston is placed on the half-pay list, Scale B, from March 30 to April 21 inclusive; Lt. H. E. H. Pain, R.N., Flying Officer R.A.F., relinquishes his temporary commission on return to Naval duty (February 22); Lt. G. D. Gray, R.M., Flying Officer, R.A.F., relinquishes his temporary commission on return to duty with the Royal Marines (April 15).

Miscellaneous

Flying Officer on probation W. I. G. Kerby is confirmed in his appointment as Assistant Provost Marshal (March 6).

Memorandum

The permission granted to E. P. Nickless to retain the rank of Second Lieutenant is withdrawn on his conviction by the Civil Power (April 12).

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

Flt. Lt. G. M. F. O'Brien, D.S.C., R.A.F. (Retd.), is granted a commission in that rank in Class C (January 21); Flt. Lt. S. H. Reynolds, R.A.F. (Retd.), is granted a commission in that rank in Class C (March 8).

The following are transferred from Class A to Class C on the dates stated:—Flt. Lt. F. P. Donovan, M.B.E. (March 16); F/O. (Hon. Flt. Lt.) C. J. Farrell (December 11, 1936).

F/O. (Hon. Flt. Lt.) C. F. Uwins, A.F.C., is transferred from Class C to Class A (April 7); F/O. L. B. Greensted is transferred from Class C to Class AA (ii) (March 19); the commission of Acting Pilot Officer on probation J. R. S. Burton is terminated on cessation of duty (April 17).

AUXILIARY AIR FORCE

General Duties Branch

No. 609 (WEST RIDING) (BOMBER) SQUADRON.—F/O. H. E. H. Pelham-Clinton-Hope, Earl of Lincoln, is granted the honorary rank of Flight Lieutenant (April 19).

AUXILIARY AIR FORCE RESERVE OF OFFICERS

Medical Branch

F/O. T. E. Crawthorne, F.R.C.S., L.R.C.P., relinquishes his commission on completion of service (March 13).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commanders.—B. A. Malet, D.F.C., to Headquarters, R.A.F., Middle East, Cairo, Egypt; for duty as Chief Signals Officer, 29.3.37. P. E. Maitland, M.V.O., A.F.C., to No. 205 (F.B.) Squadron, Seletar, Straits Settlements; to command, 10.3.37. Sqn. Ldr. (A/Wg. Cdr.) C. Hallawell, to Special Duty List; on appointment as Air Attaché, Moscow, 8.4.37. L. G. Maxton, A.F.C., to R.A.F. Station, Harwell; to command, 14.4.37.

Squadron Leaders.—J. L. F. Fuller-Good, to No. 203 (F.B.) Squadron, Basrah, Iraq; for Flying duties, 17.3.37. J. McFarlane, M.C., A.F.C., to No. 240 (F.B.) Squadron, Calshot; for flying duties, 1.4.37.

Flight Lieutenants.—R. Cleland, to No. 216 (B.T.) Squadron, Heliopolis, Egypt, 1.4.37. G. F. Humphries, F. R. Drew, G. R. Brice, A. G. F. Stewart, J. C. Sisson, to No. 240 (F.B.) Squadron, Calshot, 1.4.37. R. D. Bradford, to R.A.F. College, Cranwell, 22.3.37. C. Broughton, G. K. Horner, to No. 2 Flying Training School, Digby, 22.3.37. J. J. Watts, to No. 3 Flying Training School, Grantham, 22.3.37. K. Lea-Cox, to No. 5 Flying Training School, Sealand, 22.3.37. A. H. Garland, E. A. Douglas-Jones, A. W. Langton, to No. 6 Flying Training School, Netheravon, 22.3.37. R. J. Gosnell, to No. 7 Flying Training School, Peterborough, 22.3.37. A. J. Biggar, R. Sorel-Cameron, to No. 8 Flying Training School, Montrose, 22.3.37. D. A. Pemberton, to No. 9 Flying Training School, Thornaby, 22.3.37. R. K. Brougham, to No. 10 Flying Training School, Tern Hill, 22.3.37. M. F. Calder, D. J. P. Lee, to No. 11 Flying Training School, Wittering, 22.3.37.

Flying Officers.—G. N. Amison, to No. 2 Flying Training School, Digby, 22.3.37. H. S. Darley, to No. 7 Flying Training School, Peterborough, 22.3.37. E. T. Smith, to No. 10 Flying Training School, Tern Hill, 22.3.37. P. E. Hadow, to No. 10 (Bomber) Squadron, Dishforth, 5.4.37. G. S. A. Parnaby, to No. 240 (F.B.) Squadron, Calshot, 1.4.37. C. L. Gomm, to No. 14 (B) Squadron, Amman, Transjordan, 30.3.37.

Pilot Officer.—W. I. McConnell, to No. 223 (B) Squadron, Nairobi, Kenya, 3.4.37.

Accountant Branch

Pilot Officer.—P. S. Dundas, to No. 2 (A.C.) Squadron, Hawkinge, 15.4.37.

Medical Branch

Group Captain.—T. Montgomery, to Headquarters, R.A.F., India, New Delhi; for duty as Principal Medical Officer, 25.3.37.

Flight Lieutenants.—S. B. S. Smith, to Central Medical Establishment, London, 16.4.37. R. C. H. Tripp, to No. 1 School of Technical Training (Apprentices), Halton, 9.4.37.

Flying Officers.—D. F. Cameron, to Home Aircraft Depot, Henlow, 15.4.37. W. T. Buckle, to No. 5 Flying Training School, Sealand, 15.4.37. J. D. Milne, to No. 9 Flying Training School, Thornaby, 15.4.37. J. C. Taylor, to No. 10 Flying Training School, Tern Hill, 15.4.37. H. O'B. Howat, to No. 11 Flying Training School, Wittering, 15.4.37.

DEATH OF CAPT. F. E. GUEST

WITH great regret *Flight* has to record the death, on April 28, of Hon. Air Commodore and Captain the Honourable and Right Honourable Frederick Edward Guest, P.C., C.B.E., D.S.O., M.P., one time Secretary of State for Air.

Third son of the first Lord Wimborne, Frederick Guest was born in 1875, and was educated at Winchester. He received a commission in the 1st Life Guards, and saw active service on the White Nile in 1900, in the South African War, and in the Great War. In 1921-22 he was appointed Air Minister, but at that time so little money was available for either civil flying or for the R.A.F. that he was able to accomplish very little. Afterwards in his private capacity he became far more active in endeavours to extend the flying movement, and most of our readers will remember the "Guest Scheme" for providing a large number of aerodromes throughout the country. That at least showed energy and initiative, though it did not succeed in its object.

Later on, Capt. Guest became the C.O. of No. 600 (City of London) Squadron of the Auxiliary Air Force, with the rank of squadron leader, and when he had completed his term of command he became Hon. Air Commodore of that squadron. While still in command he learnt to fly, though his age was 55 at the time. He became a private owner of aeroplanes, and several times entered machines for the King's Cup. He was also the Master of the Guild of Air Pilots and Air Navigators, and his varied energies deserve the gratitude of all who have worked to advance the cause of flying.

CIVIL AVIATION'S NEW H.Q.

VICTORIANS may remember that once upon a time the erstwhile Marconi House in the Strand was the Gaiety Restaurant. Later it became a developing-centre of the Marconi company's wireless communication services, and the first 2LO studio. Now it has a new association with "the air," for last Friday the building was opened by H.R.H. The Duke of Kent as Ariel House, the new H.Q. of the Department of Civil Aviation.

Many considerations, chiefly due to the inadequacy of Gwydyr House to accommodate three newly organised directorates, have necessitated the acquisition of Ariel House, which has the advantage of a convenient, central position, suitable accommodation for offices and new and old departments, and of being in close proximity to the main Kingsway buildings.

The Director General of Civil Aviation, Lieut.-Col. Sir Francis Shelmerdine, C.I.E., O.B.E., F.R.Ae.S., is in control of the three new directorates. They are Home Civil Aviation, under the direction of Mr. J. G. Gibson; Overseas Civil Aviation (director, Mr. C. J. Galpin, D.S.O.); and Operational Services and Intelligence (director, Mr. I. H. McClure, D.S.O.). The Finance Department, the Directorate of Signals and the newly instituted Information Bureau are also handsomely housed in the new building. This last-named section is situated on the ground floor, and has its own separate telephone, Temple Bar 3553. All enquiries with regard to any matter connected with Civil aviation at home or abroad will be dealt with, whether made by personal visit, 'phone, telegraph or post. Information will be given on passport matters, regulations and current weather reports and, although air travel tickets will not be sold, time tables, cost, and directions to the appropriate agency may be obtained.

H.R.H. the Duke of Kent was received for the opening ceremony by Viscount Swinton, Sir Phillip Sassoon, M.P., and Lieut.-Col. Sir Francis Shelmerdine, and the party proceeded to the main hall. The Secretary of State for Air opened a fine speech by thanking H.R.H. the Duke for coming to open Ariel House, and welcoming by name several of the distinguished company present, including M. Pierre Cot, French Air Minister, The Hon. Archdale Parkhill, Australian Minister of Defence; Sir Francis Shelmerdine, Director General of Civil Aviation; Maj.-Gen. The Rt. Hon. Sir Fredrick Sykes, late Controller General of Civil Aviation; Lt.-Col. J. Daumerie, Director of Aeronautical Administration in Belgium; Col. Lindbergh; and the Japanese aviators, Mr. Masaaki Iinuma and Mr. Kenji Tsukagoshi, who were applauded.

Lord Swinton spoke of the work to be carried out in the new house and placed the aviation problems facing the country under three headings, National, Imperial and International.

His Royal Highness then spoke, and touched on many matters concerning the growth of air traffic. At the conclusion he broke a small Civil Aviation Ensign over the dais, and declared Ariel House open. A large ensign was broken outside the building simultaneously with that in the hall.

Following the ceremony, a reply to a message sent by the Duke on his arrival was received from the Imperial Airways Empire flying boat *Courtier* in the Mediterranean. The message and reply were as follows:

H.R.H. the Duke of Kent's message: "Commander, *Courtier:* In opening Ariel House New Headquarters Department of Civil Aviation London I sent my best wishes to *Courtier* for all passengers and crews of British aircraft flying overseas."

Reply from Commander of Courtier: "To H.R.H. Duke of Kent: Thank you Sir for your gracious message just received STOP . . . We are flying at 6,000ft. over the Mediterranean on our way to Alexandria in fine weather STOP . . . Ship's company and passengers wish good luck to all at Ariel House."

The Secretary of State then called the Empire boat *Caledonia*, which was circling over Ariel House, and a short R/T. conversation was carried on which was broadcast by loud speakers to those in the Hall. Commander Wilcockson, of *Caledonia*, could be very clearly heard when replying to Viscount Swinton.

A photograph of the ceremony appears on page 458.

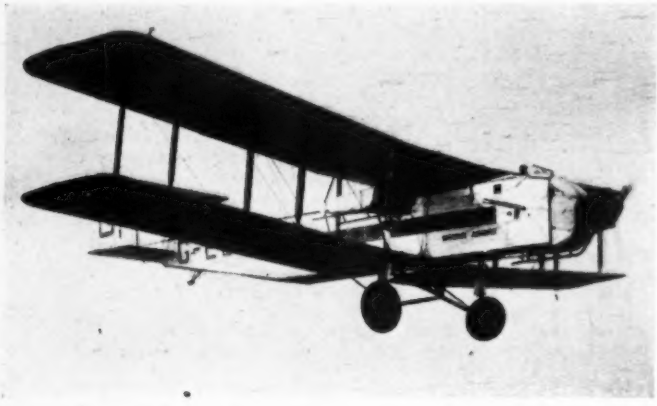
TRANSPORT BEGINNINGS

A Brief History of the Early Years of Air Transport : Navigational Development

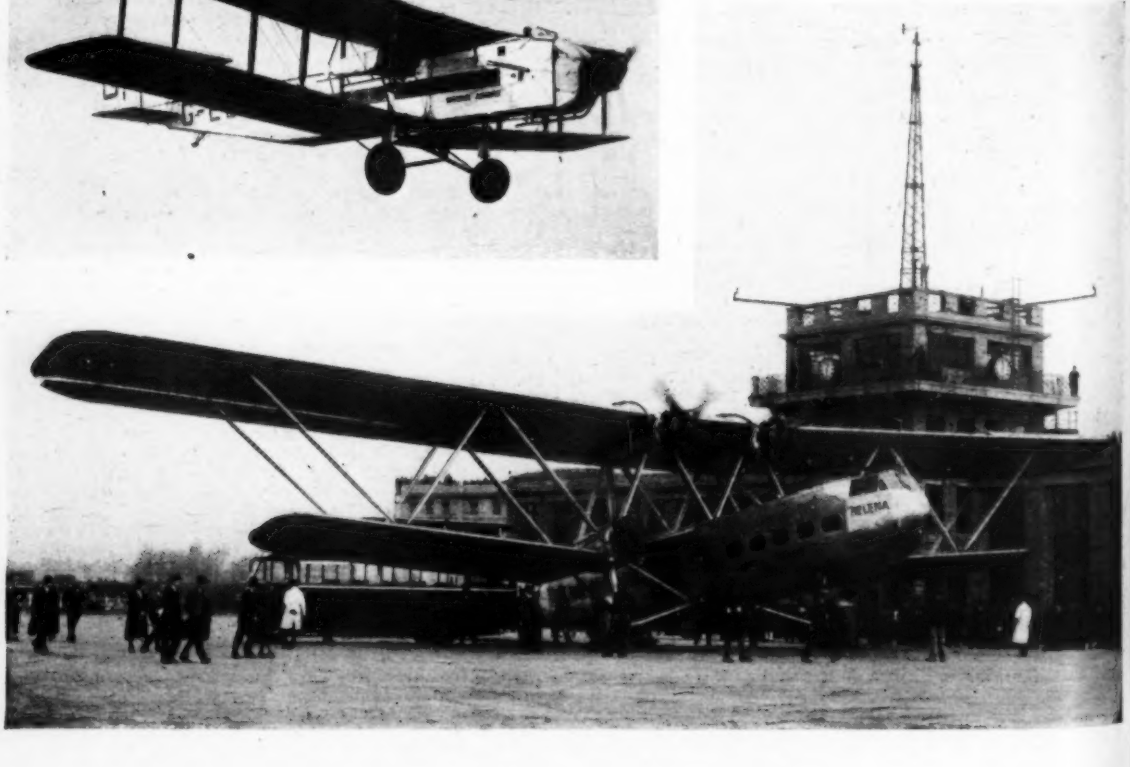
Sir Samuel and Lady Hoare were passengers on the first through flight by Imperial Airways to Karachi. A D.H. Hercules was used and the regular weekly service started four months later—on March 30, 1929.

IT is customary for those who write long and detailed histories of aviation either to state that air transport began only after the last war—which is largely true—or to describe balloon and Blériot postal experiments of pre-War days and to suggest that there were the beginnings—which is only partly true. Very seldom, however, is it remembered that three Zeppelins, the *Viktoria Luise*, the *Hansa* and the *Sachsen*, carried between them 19,100 passengers over 65,500 miles during 1912 and 1913—figures of which transport operators might be quite proud to-day. The *Sachsen*, incidentally, had a maximum speed of about 50 m.p.h. and a cruising radius of nearly 1,400 miles. Since those far-off days the aeroplane has made the progress which might have been expected, but such performances as these formed a fitting prelude to those put up by the L.Z. 127 and 129 over the Atlantic in recent years.

Suitably chastened, we may now be allowed to remember that the value of the aeroplane for fast and comfortable transport was first appreciated by the various delegates concerned in the Armistice negotiations, when slightly converted war machines were used. It was in 1919 that the first air transport company was formed by that great pioneer, Mr. G. Holt Thomas. The concern was known as Aircraft Transport and Travel; and its first job was that of taking stores to Belgium during the reconstruction of that unfortunate little country. Like many another pioneer



The A. W. Argosy (left), a type which was put into service by Imperials in July, 1926, and brought the possibility of unsubsidised air transport a stage nearer. Below is the scene at Croydon when "the first 12.30 for Cape Town" left in 1932.



concern, A.T. and T. faded out early, but it had pioneered the London-Paris service and its competitors were left in the running until the Government came to their aid and, in fact, until Imperial Airways was formed in 1924. Prematurely convinced that the "air age" had arrived—or would arrive almost immediately—a number of people put up money for the development of internal air routes, and those who stuck to the joy-flying made quite a good thing out of it. Most interesting of all, perhaps, was the Avro service operated in 1919 between Manchester, Southport and Blackpool; this was the first of the "holiday" services which, many years later, were to help internal unsubsidised air transport on to its feet.

The first serious attempt to run a trunk internal service was made by Daimler Airways, an offshoot of the Daimler Hire Company, in 1922 and 1923, using D.H.34s. In one month a total of 134 passengers was carried and the service was only temporarily discontinued after a serious accident directly resulting from difficult weather conditions—conditions such as those which are only now being defeated. At that period there were four companies in action in this country, and three of them were subsidised. Daimler Airways ran, in addition to the Manchester service, one to Amsterdam; the Handley-Page Transport Company ran a London-Paris service; Instone Air Lines ran between London and Brussels, with a temporary extension to Cologne; and the British Marine Air Navigation Company were to run to the Channel Islands, Cherbourg and Havre.

Meanwhile a British airship, the R.34, had already shown the possibilities of lighter-than-air craft for long-distance work by flying from here to New York and back. Unfortunately, the loss of the R.38 over the Humber, and the later tragedy with the R.101, at least temporarily killed the airship as far as this country was concerned.

Almost as soon as air transport made a start it was realised that Government guidance was necessary, and *Flight*, even in those days, was consistently stressing the need for some definite policy. In March, 1919, a skeleton Air Navigation Bill was passed by the House, and a Directorate of Civil Aviation formed under Sir Frederick Sykes. He was followed by the late Sir Sefton Brancker, who held the position of Director until his death in the ill-fated R.101 in 1930. It was during the office of Lt.-Col. (now Sir Francis) Shelmerdine that the designation of Director-General of Civil Aviation came into being.

When Imperial Airways was formed in 1924 as the National Air Transport Company the possibilities and value of Empire air services first appeared. In 1921 the Cairo-Baghdad service had been inaugurated by the R.A.F., when three machines of No. 47 Squadron made the journey, and the mail services were thereafter operated by Nos. 45 and 70 Squadrons. After survey work, carried out in 1925 and 1926, had been completed, a fortnightly Cairo-Basra service was opened early in 1927 by Imperials with the D.H. Hercules class of machine. By the middle of that year the frequency had been increased to a weekly basis, and in March, 1929, the first weekly service was flown through to India. In the meantime the Short Calcutta class had been put into commission for the Mediterranean crossing. The following year saw the introduction of a flat air mail rate for letters to European destinations and the completion of an African route survey, paving the way for the first regular service between London and Tanganyika in 1931, when, also, the India service was experimentally extended through to Australia.

It was not until December, 1933, that the schedule was extended to Singapore, but only a year later arrangements had been completed, with the help of Qantas Empire Airways, for the through service to Brisbane. During the previous year the African service had been extended to Cape Town on a weekly basis, and in December and January of 1934 and 1935 both the Calcutta and the Johannesburg schedules had been increased to twice weekly.

Perhaps the most important of all declarations was made in December, 1934, when the Government announced that, starting in 1937 and as a matter of principle, all Empire mail would as far as practicable be sent by air. That statement foreshadowed the introduction of the all-air scheme and the use of the Short Empire boats with which, in due course, through services will be run, without change of machine, from Southampton or Portsmouth to Sydney and Durban.

This, however, is recent history and forms no part of a summary. Similarly, the resurrection of the internal air lines since their virtual collapse in the very early years is a matter both too recent and too involved to be detailed in any really satisfactory manner.

One of the pioneer transport pilots, Capt. "Jerry" Shaw, now with the Shell organisation. He flew for Aircraft Transport and Travel in 1919. Capt. "Bill" Lawford was actually the first pilot to fly the regular London-Paris service.

Two navigational developments have played a large part in making airline operation both safe and reliable—wireless communication in its various uses and forms, and the gyroscopic blind-flying instrument. It would be fair to say that air transport, in any real sense, would not have been possible without such aids.

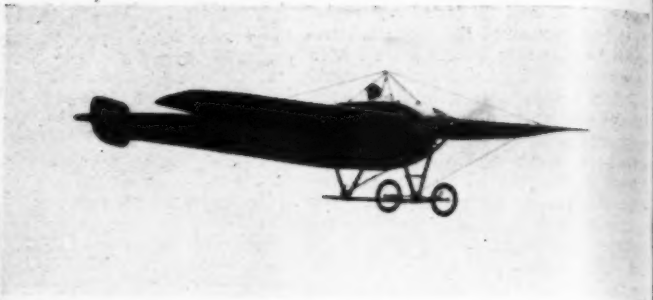
As long ago as 1912 the Marconi Company started experiments with radio as applied to aircraft, and even in 1919 it was possible to make real use of such equipment. It was in the development of direction-finding as applied to aircraft operation, however, that the real value of radio appeared. Elsewhere, notably in the U.S., the D/F aids have consisted of permanently arranged beam systems, but over here such a method has only recently come into use for the purpose of final approach guidance—and then with characteristically deformable ultra-short waves. Judging from American experience it would seem that the European methods are more satisfactory, though a final solution must still be found for the problem of congestion.

Blind Flying

The application of radio, of course, could only be usefully made with the help of blind-flying instruments. Here, again, experiments were really started in pre-War days, when Major Reid worked on navigational instruments, and the Sperry Company experimented with a form of gyroscopic automatic stability device. As far as this country is concerned the pioneers in this line were Reid and Sigrist. A useful order for their turn indicator, which has remained virtually unaltered since that time, was first placed by the Air Ministry in 1929 and this instrument became the basis of the method of blind flying training developed by the Central Flying School.

Nowadays it is customary for transport machines to be fitted with what are known as free gyro instruments, in which the actual displacement of the machine relative to one of the three datum lines is shown, but the simpler and necessarily less sensitive turn indicator is still universally fitted as a second string.

From the gyroscopic instrument to the automatic pilot is but a step—if a difficult one—and the modern transport machine carries two-way radio for long and short waves, direction-finding and homing equipment, a beam approach receiver, an automatic pilot and the necessary blind-flying instruments. What will another twenty-five years bring?



PRIVATE FLYING

Topics of the Day

Looking Back

UNUSUALLY enough, the heading picture for this page has, for once, some connection with my writings. This being a Progress Number, I made a patient search in the dusty pre-War numbers of *Flight* in order to discover some useful machine from which a lesson—if only an insulting one—could be obtained. After an even more patient search the chief photographer managed to lay his hands on two interesting negatives, the prints from which are reproduced.

These pictures were taken during the Gordon Bennett trials of July, 1911—yes, I said 1911—and show the little Nieuport single-seater, which, with an engine of only 28 h.p., managed to average about 60 m.p.h. for 50 kilometres before things started to disintegrate and the 28 h.p. was reduced to the −10 h.p. provided by dead-stick drag. Probably its maximum was in the region of 70 m.p.h. The gentleman who is seen standing so proudly in front of the somewhat naïve little flat twin engine is M. Chevalier, the pilot.

In order to escape, if possible, some just invective from the manufacturers and happy owners of the present-day counterparts of this aeroplane, I will not point the moral. Probably the Nieuport was not very strong, and it certainly did not appear to be remarkably reliable. But—1911 . . .!

Horse Sense

WITHOUT pointing such a moral, however, and forgetting all about the bit of ancient history at the top of the page, I still repeat that the ultra-lightweights which will survive into the year A.D. 1938 must be both safe and useful.

One can forget speed and range if a machine can be put put down in and taken from any field with ease and safety. Such a lightweight will be used largely for fun—and inexpensive fun at that. Aerodrome landing and take-off runs, as well as flat approaches, can be permitted if the speed is high and the range is ample. Then one is obtaining full-scale performance at half-scale cost. But preserve me from the flying brick which just staggers into the air and clears the tree-tops by a bare margin of three feet—while flying within 5 m.p.h. of the stall.

Up to a point it is the old story: You can have low wing-loading and high power-loading, or vice versa, but high wing-loading *and* high power-loading can only be permitted together when the machine is extremely clean and generally efficient. And I'm not quite sure of that. Certainly, machines in this last category should be for the use only of experienced pilots who can look a typical American freak Cleveland racer in the airscrew boss and still smile. I once saw a film of two landing crack-ups with such machines; me for the slow and stately—within reason, and at least when the weather is thickening and the only fields to be seen down below look like postage stamps.

As I've remarked once before, incidentally, speed can upset all one's instinctive E.T.A. ideas in thick weather. When in doubt throttle well back and wind down the flaps, if any.

Strange Failures

DESPITE the apparent soundness of these reflections, I should not care to prophesy success for any one particular ultra-lightweight. Though the D.H. people deserve every bit of praise for their forethought in refusing to build a machine to the Lympne Trial specification in the long-ago days of 1924, developments might have been very different had there been some more suitable low-powered engines to be obtained at the time.

Very few people realise that the D.H. Moth was not even the first machine of its style. The Blackburn Bluebird, in its original form, came out a few weeks before the Cirrus Moth, but, for many reasons, this machine was not the one to succeed. Even the excellent Avian could do little, though quite a number were sold. It just happened like that.

Another strange failure was the Desoutter monoplane, one of the easiest and safest machines. The fact that the wings would not fold might not now be considered to be a fair reason for lack of popularity—and there was no need for the dithering "smoke-stack" exhaust arrangement. All I know is that it would remove itself from the ground hands-off and that one could read a book on a cross-country, though wood-screws *did* fall out of the dashboard at certain throttle openings and the machine ran and ran downwind—when there was little directional control anyway. Wheel brakes and flaps would have made all the difference.

Even the Cirrus I Moth had an exhaust pipe placed so that it burnt one's chin on occasion, and it split longerons if landed too heavily on its hard-tyred, one-inch-movement undercarriage. It is a long time since we could watch the valve rockers rocking and feel the heat from the cylinder heads on a summer's day. There's progress!

INDICATOR.

AN OUTSTANDING VISITOR

The B.F.W. Taifun in England : Preparing for the Anglicised Version

AS the type which took both second and fourth place in the Oases Circuit—the general efficiency trial held during the meeting in Egypt a couple of months ago—the B.F.W. Me.108 (Taifun) might be expected to exhibit some outstanding qualities. Last week a number of people at Croydon, Heston, Hatfield and Reading had a chance of examining this interesting German machine for the first time. In fact, however, this was not its first visit to England, since one was brought over for the Week-end Aerien last year.

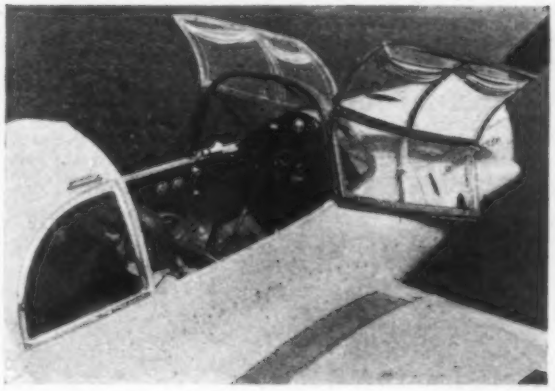
The Taifun, which is a stressed-skin, four-seater, low-wing cabin monoplane, has already been described in *Flight*, and it may be remembered that A.F.N., Ltd., of Isleworth, makers of the Frazer-Nash and English B.M.W. cars, have obtained the agency for the machine over here. Mr. Aldington's idea is to offer a really outstanding aeroplane, at least by way of an experiment. Although the price in this country will be high—in the region of £3,000—he has good reason to believe that a fair number of private owners will be prepared to spend that much money in order to have the pleasure of flying something which certainly has no complete counterpart, as yet, in this country. An all-metal machine which cruises at 162 m.p.h., yet lands at 45 m p.h., is easy to handle and is fully controllable at 50 m.p.h., deserves some attention.

Last week's visit was concerned largely with a little "measuring up" by De Havillands for the Series II Gipsy Six and v.p. airscrew with which the English version will be fitted—the visiting machine had a 240 h.p. Argus AS 10-C inverted vee-eight engine—and with which the performance is expected to be even better.

First Impressions

The Taifun arrived at Croydon on Wednesday of last week, after flying non-stop from Frankfurt in about three hours (135 m.p.h.) against a 25 m.p.h. headwind, and on the following day I was given the opportunity of helping to find the way thence to Heston in visibility of the mile-or-less order, and, later, of discovering what the machine would really do. Herr O. H. Brindlinger, the B.F.W. chief test pilot, was flying the Taifun and the other passenger was Herr Waldemar von Perthes, a director of the company. Even on this short cross-country, during which I was much too occupied in picking up hazy landmarks as they were passed at 150 m.p.h. or so, it was possible to gain some idea of the machine's qualities.

Once the engine is throttled back to cruising revolutions, for instance, the cabin is extremely quiet, the noise being limited almost entirely to the inevitable airflow "flutter." The range of vision is good, and there is ample room in the four seats. A full-bore steep turn, made on arrival at Heston, showed something of the machine's control capacities. Later investigation proved, not only that the ailerons are light and powerful, but that keel surfaces and so forth are sufficiently nicely proportioned for turns up to the vertical to be possible by using the stick alone. In level flight it is perfectly stable and can be flown hands and feet off in reasonably smooth air.



How the two doors of the Taifun open to leave the entire cabin clear for entry and egress. (*Flight* photograph).

Most interesting of all are its flying qualities at low speeds with the flaps down; these are of the straightforward type, and are supplemented by "free" slots. In the normal approach at about 65 m.p.h. the glide is usefully steep, but the machine is under full control at an indicated 80 km.h. (50 m.p.h.) when the attitude is more nearly level and the sink quite pronounced. The speed of the touch-down is in the region of 70 km.h. (44 m.p.h.)—remarkably low for a machine with such a comparatively high cruising speed and giving a speed range of something better than 4 to 1.

Several features in the control layout make for handling ease. The centrally disposed hydraulic pump lever for undercarriage retraction, for instance, has a self-locking, twist-grip action for the change-over, and the operation demands some twenty light strokes. There is an indicator beside it and a hooter gives due notice if the throttle is closed before the undercarriage is fully down. The flaps are mechanically operated by means of a wheel on the pilot's left and the stabiliser wheel lies directly beside it, so that the two may be turned together during the approach. Incidentally, for the take-off the flaps are adjusted to be about ten or fifteen degrees down to obtain the best results.

Finally, the arrangement of the cabin doors-cum-roof deserves special mention. Each door swings wide open towards the engine, leaving the entire cabin free for entry or exit, and there are quick-release levers permitting their complete disintegration in case a be-parachuted exit or an abnormally rapid ground departure is necessary

H. A. T.

The lines of the Me. 108 are well shown in this *Flight* photograph, taken at Reading—with P. and P. employees "seeing how."

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —

CIVIL CENTRE: H.R.H. the Duke of Kent breaks the civil air ensign at Ariel House, the new civil aviation headquarters of the Air Ministry. On the wall behind can be seen a relief map of the world's long-distance airlines—present and projected. A description of the ceremony appears on p. 453.

THE WEEK AT CROYDON

Spring in the Air and Heat in the Pipes : North-Easterns Extend : Wanted —New Airport Handbook

MAY came in with good cheer, white cap tops, and a general air of satisfaction at more settled weather. Of course, there was the odd person who had forgotten that May 1 calls for an addition to the laundry bill, and who appeared with "winter dress" so far as uniform headgear was concerned. The established companies, who make their own uniform "issues," were not caught out.

We are without lambs at Croydon to herald the advent of spring—or summer—but we noticed the airport fireman to be watering our greensward—officially, one supposes, to test hydrant pressure and his line in hose! Then even the oldest denizens ogled at the unusual sight of the two Imperial Shorts—dare one say Scyllii—taking off almost in formation, respectively Paris- and Cologne-bound. "Quirks and Guildings," too, still play their annual chestnut of circulating the hottest of hot water through our office radiator system now that the warm weather definitely appears to be here.

Until the Bus Strike, one never quite appreciated how dependent is Croydon upon the service, but the famous "194-from-East-Croydon-Station-which-will-land-you-right-at-the-airport-door," being painted red instead of green, is among the missing routes. The strike also shows how lazy is the average visitor to Croydon, for unless there are easy means of access the man-in-the-street will not trouble to visit us. Even so, the joy-ride companies had quite a good week-end, assisted, without doubt, by the usual Cup Final visitors, who flew with Olley's and Surrey's, the latter having their Dragon *Blue Mist* in service again after C. of A.

Parachute Testing

The Brian Allen Cessna has been putting in some useful work parachute-testing at Letchworth, where the Irvin Chute is made. Mr. Holmes tells me that he has dropped fifty-seven 'chutes in an hour, and over seventy in all. A special gear with automatic rip-cord has been made up by Anglo-American Aircraft and Engine Service, and the procedure is to climb to 200 ft. and pull the trigger, when the parachute opens some 20-30 ft. below the machine. It may give prospective users confidence to know that every parachute so far tested has opened immediately.

Without undue rush or much notice, North-Eastern Airways have been operating very nicely and to schedule on their Scottish run. Not content with this success they are opening up shortly on another compass point, to the S.E., where they will extend to Le Zoute, in Belgium. To this end they have ordered two new Rapides for late June delivery, and have augmented their staff, Messrs. Roland Falk, Allan Naish and B. Cliff for pilotage, and B. Young as radio-operator. Mr. J. K. Morton, late of B.C.A., has recently joined North Easterns as Air Superintendent, and, talking of this post, I am reminded that Capt. L. A. Walters, of Imperial Airways, has been receiving many congratulations on the confirmation of his appointment as Deputy Air Superintendent.

Coronation enquiries for night flying still pour in, and, though there are as yet no signs of special decorations in our main hall—apart from the cheery new K.L.M. booking office (so dignified by the absence of posters and literature)—the aerodrome hotel has thus early gone gay with bunting without, while within the smell of new paint heralds some change in colour scheme. Even so there must be many pilots who would willingly have forgone redecoration had additional sleeping accommodation been forthcoming instead.

Some time ago we of the airport and our visitors were promised a new edition of the "official airport guide purchasable in the main hall, price 2d." Sales presumably have not been brisk of late, otherwise the 24,000 odd copies which we last heard to be still for distribution must have been substantially reduced. As its pages contain information no longer appropriate to our development, as well as advertisements for flights on aircraft such as the long-since abandoned Avro 504, one cannot blame visitors for refusing to acquire a brochure, the cover of which also pictures a now obsolete aircraft surrounded, *on the* tarmac, by members of the bustling public.

T. A. R. MAC.

Right Across

ON April 28 a Pan-American Airway's Martin Clipper flew through to Hong Kong for the first time on a scheduled service. Previously, the regular Pacific service had its terminal at Manila

Atlantic Experiments

IT is probable that the first experimental transatlantic flight by Imperial Airways will, weather permitting, be made next week. All the arrangements are complete, but there is some doubt whether the ice will have cleared sufficiently at Botwood.

Electras for New Zealand

UNION AIRWAYS have ordered three Lockheed Electras for use on their Auckland-Wellington line. Two of the machines should now have left Los Angeles while the third is scheduled to be shipped on May 24.

It will be remembered that Union Airways are a subsidiary of the Union Steamship Company, which is also strongly interested in Australian National Airways.

New European Connections

THE Latvian Government has announced that a new line linking Moscow-Luki-Velikija-Riga-Gotland-Stockholm, will shortly be started, as the Soviet Government are interested in establishing another air connection with Northern and Western Europe. It is further said that the new service will be extended later to London and Paris. Meanwhile, flying will, in that case be abandoned on the Moscow-Kowno-Berlin route—previously operated by Deruluft, which was liquidated on January 1.

Transport Research

MR. B. O. HOWARD, the pilot and designer, has been appointed to the post of flight research engineer in United Air Lines' technical division. He will be pilot and flight engineer of United's "flying laboratory," a twin-engined Boeing 247-D.

Mr. Howard has, for the past seven years, been on United's eastern division While on leave of absence in 1935, he piloted one of his own single-engined racers across the Continent in 8 hr. 33 min to win the Bendix Trophy. He has fully recovered from the injuries he sustained while flying a similar machine in the New York-Los Angeles race last year.

Maj. R. W. Schroeder will shortly resign from his position as first assistant director of the Bureau of Air Commerce to accept an executive post in the operations department of the same company.

All in a Day

SINCE this issue is one recording the aviation progress of the past twenty-five years it will not be out of place to give the details of a typical day's work by Imperial Airways and associated companies. Few people realise quite how much flying is done every day on the Empire routes. The astounding total of 14,572 miles does not, of course, include the flying carried out on the European division.

OUTWARD BOUND.

R.M.A.	From.	To.	Distance.
			miles.
Adelaide (D.H.86) ...	Darwin ...	Longreach ...	1,323
Andromeda (A.W. Atalanta) ...	Salisbury ...	Johannesberg ...	678
Artemis (A.W. Atalanta) ...	Calcutta ...	Bangkok ...	1,019
Hengist (H.P.42) ...	Juba	Kisumu ...	—
Astraea (A.W. Atalanta) ...	Kisumu ...	Nairobi ...	659
Diana (D.H.86) ...	Geneina ...	Kano	965
Horsa (H.P.42) ...	Baghdad ...	Sharjah ...	953
Canopus (Short Empire) ...	Marseilles ...	Brindisi ...	802
Courier (Short Empire) ...	Southampton ...	Marseilles ...	700

HOMEWARD BOUND.

Brisbane (D.H.86) ...	Brisbane ...	Cloncurry ...	1,011
Aurora (A.W. Atalanta) ...	Singapore ...	Bangkok ...	988
Atalanta (A.W. Atalanta) ...	Jodhpur ...	Karachi ...	—
Atalanta (A.W. Atalanta) ...	Karachi ...	Sharjah ...	1,124
Capella (Short Empire) ...	Brindisi ...	Southampton ...	1,502
Amalthea (A.W. Atalanta) ...	Joburg ...	Broken Hill ...	996
Hadrian (H.P.42) ...	Khartoum ...	Luxor	780
Castor (Short Empire) ...	Rome	Southampton ...	1,872
		Day's Total ...	**14,572**

Sino-Japanese

THE Hui Tung Company, which is a Sino-Japanese enterprise, recently opened a daily two-way air service between Tientsin and Dairen.

Holland to Australia

THE Commonwealth Government has decided to permit K.N.I.L.M. to extend its service to Darwin. Presumably this agreement has some connection with the important necessity for the Empire boats to use East Indian harbours and landing grounds—at present Qantas have the right to fly over the Netherlands East Indies.

Honour for Air Line Manager

MR. J. N. BAMFORD, the London manager of Air France, has been awarded the Cross of a Chevalier of the Legion of Honour by the French Government in recognition of his services in building up the passenger and freight services of the French air lines during the past seventeen years. Mr. Bamford, who is 37, joined the first French air service operating between London and Paris, the Messageries Aeriennes, in 1920. This was later superseded by the Air Union and finally absorbed into Air France in 1930. He has been in charge of the London office since 1930.

Flying Boats to the Hebrides?

ACCORDING to the somewhat meagre available information, it appears that the projected flying-boat service between the Clyde and the Outer Hebrides will be opened on June 1. An order for the first boat has been given, it is reported, to Short Brothers. The Clyde base will be at Greenock and services will be run to Tobermory, Portree and Stornoway. The Greenock Harbour Trust have granted a ten-years lease to West of Scotland Airways to establish a base in the Great Harbour. A floating fuel station will be moored in Stornoway Harbour. It is also reported that Fort William will be an intermediate base, and that other services will radiate from there. No confirmation of these plans had been obtained at the time of going to press.

Maybury Comments

THE Commercial Aviation Committee has forwarded to the Secretary of State for Air a number of comments on the Maybury report. The need for rapid communication between the centre of London and its airports and for the provision of taxi-service landing places in, or close to, built-up areas like the Metropolis, is emphasised. Research in this field might also, the Committee suggests, include the development of an amphibian to take off from the outer aerodromes and land on the Thames and of a special high-lift wing machine suitable for roof landing.

As far as the junction system is concerned, the Committee, whilst opposed to the granting of an exclusive licence for a period of five years to a single company, agrees with the recommendation in the report that such a licence should be given to a combination of companies. It thinks, however, that no company or companies would contemplate operating the system unless provision were made for a subsidy or direct payment to tide them over the interim period. There should be no delay in the setting up of a route licensing authority. Steps should be taken immediately to implement the recommendation regarding the provision of radio facilities and a comprehensive air traffic control organisation.

The Committee also recommend that: (a) a map should be prepared delineating the air trunk routes, which should be kept up to date by the Air Ministry and be issued free of charge to all civil pilots, R.A.F. Units and training schools; (b) Regulations should be drawn up providing that no pilots should ever cross or fly along such a route except under prescribed conditions; (c) The Air Ministry should encourage research with a view to the provision of a very cheap and light two-way radio set. This should be made a compulsory fitting for all civil aircraft not otherwise provided with radio apparatus

It is suggested that all main aerodromes should preferably be acquired or provided, maintained and controlled by the Government or by municipal authorities. The Committee also urges that a flying school for the advanced training of air line pilots should be established as soon as possible. Finally, it is submitted that financial provision should be made for research wholly devoted to problems of civil flying.

Lt.-Gen Sir George Macdonogh, a past president of the Federation of British Industries, has been elected chairman of the Committee in succession to Sir Stephen Demetriadi.

AERO ENGINE DEVELOPMENT

Some 1911 Types Compared with Our Present Power Plants : 25 h.p. to 1,000 h.p.

EARLY British aviation history was made, in the main, with French aero engines. By 1911 quite a number of attempts were made by British firms to introduce suitable power plants, but few of these were crowned with any marked success. At the Olympia Aero Show of 1911 ten firms exhibited aero engines, and of these the 60 h.p. E.N.V. and the 50 h.p. N.E.C. did come into use in a few aeroplanes. The E.N.V. was an eight-cylinder vee type with cast-iron cylinders and electrically deposited copper water jackets. It weighed 310lb. and developed its rated power at 1,120 r.p.m. The N.E.C. was a four-cylinder vee water-cooled two-stroke and developed 50 h.p. at 1,250 r.p.m. Its weight, without radiator, was 150lb. Like the E.N.V. it had cast-iron cylinders and electrically deposited copper jackets.

The Green Engine Company exhibited two engines, one of 30-35 h.p. and one of 50-60 h.p. The 30 h.p. engine weighed 193lb. dry, and the 50 h.p. 310lb. The following year a 50h.p. Green won the Patrick Alexander Prize of £1,000 by developing 61.6 b.h.p. for two non-stop runs of twelve hours each. The runs were made at 1,150 r.p.m. The Green engines were four-cylinder in-line water-cooled, and a substantial flywheel was one of the characteristics.

Also at the 1911 Show was exhibited the Isaacson radial, a seven-cylinder radial air-cooled. It was rated at 50 h.p. and weighed 195lb. One of the features of this engine, which was really far ahead of its time, was a 2 : 1 reduction gear for the airscrew

The most popular engines in use just before the outbreak of war were the Anzanis, the Gnome rotary, and the Renault. The Anzanis were three and six-cylinder radial air-cooled, with automatic inlet valves. The three-cylinder developed about 25 h.p., and the six-cylinder about 40 h.p. The cylinders were of cast iron.

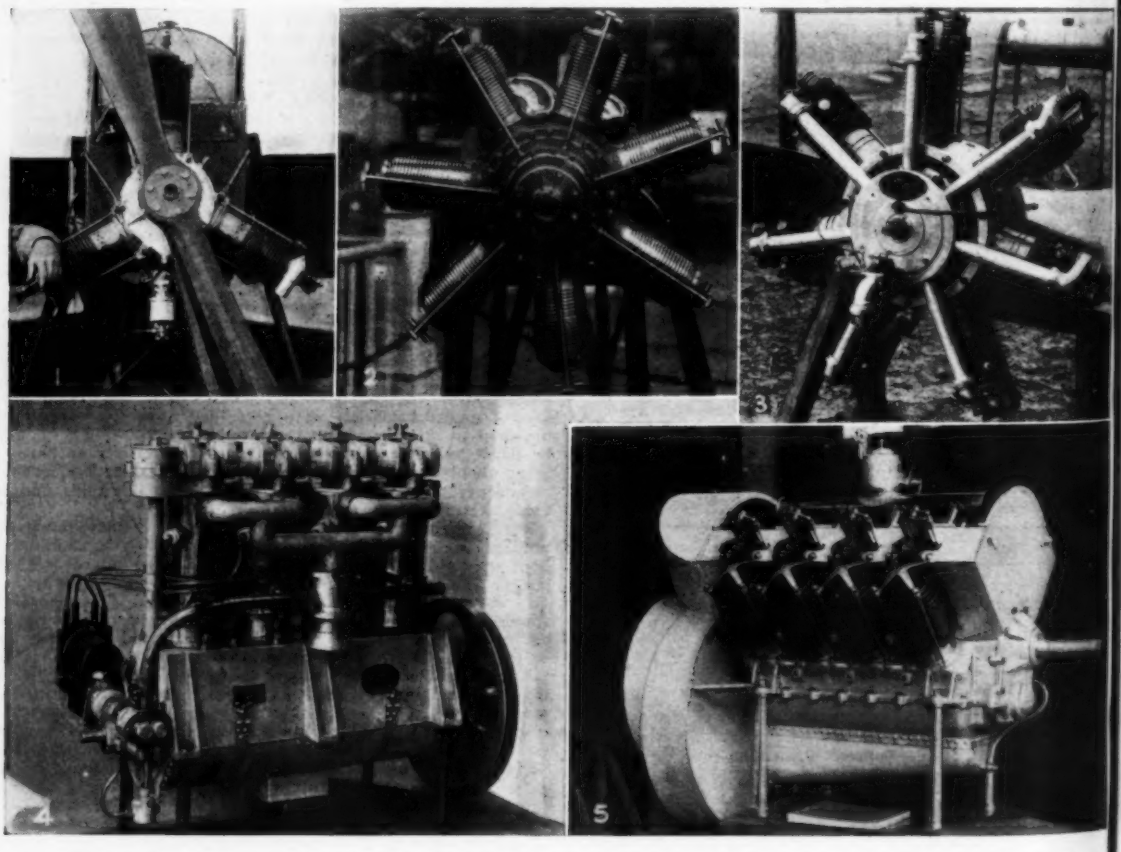
The Gnome was a very interesting engine, the crankshaft being held stationary, and the crankcase and radially disposed steel cylinders rotating around the crankshaft. The exhaust valves were in the cylinder heads, and the inlet valves in the crown of the pistons, being balanced by counter weights, and light springs If a spring broke, the inlet valve would stick in the open position, and flames would shoot out of the carburettor air intake. However, the engine was very light for its time (167lb.) and the seven cylinders rotating at 1,200 r.p.m. provided a very effective flywheel which resulted in extremely smooth running

The Renault was an eight-cylinder, air-cooled vee type, in which fan-cooling was employed, as the engine was frequently used in "pushers." The airscrew was mounted on the single camshaft, so that it ran at one-half engine speed. The 70 h.p. type weighed 400lb.

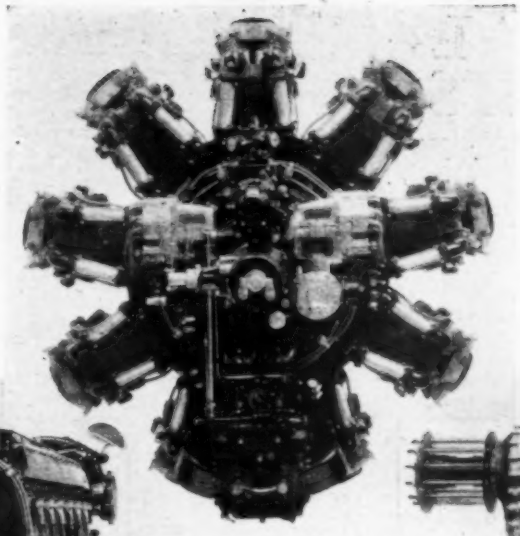
1914—1937

As the war went on British-designed engines found increasing employment and although vast quantities of power plants foreign in origin were installed into British aircraft, units both air- and water-cooled, conceived entirely in this country, made a brilliant name for themselves.

In the early war days we were using Gnomes, Renaults, and R.A.F engines, the latter of official design, which, with the addition of a few comparatively obscure types, carried us on until the introduction of such units as the Siddeley Puma,



Some early aero engines. (1) The 25 h.p. Anzani ; (2) the 7-cyl., 50 h.p. Gnome rotary ; (3) the British Isaacson radial of 50 h.p. ; (4) the 35 h.p. Green, of the most successful early British aero engines ; (5) the 70 h.p. Renault, which was cooled by a fan.

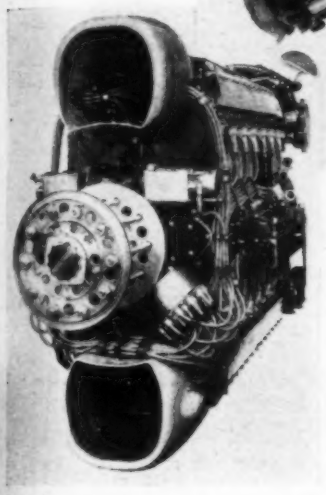


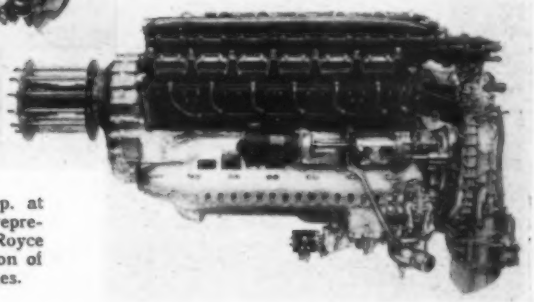
The latest Bristol Pegasus is capable of delivering well over 1,000 h.p. for take off. The series X engine is illustrated on the right.

Pegasus of to-day. The modern Mercury is a small-diameter engine produced almost exclusively as a fully supercharged type. Demands for increased power and efficiency have led the Bristol company to the production of sleeve-valve engines, including the two-row Hercules.

The Rolls-Royce *forte* has been the water- or liquid-cooled twelve-cylinder vee as exemplified in recent years by the Kestrel and Merlin, the latter delivering over 1,000 h.p. at a height of many thousands of feet. The company has profited considerably through British participation in Schneider Trophy races, when astounding powers were taken from the "R" type engines.

The two-row radial has been an Armstrong Siddeley speciality since the war, this





Delivering over 1,000 h.p. at high altitudes, the Merlin represents the latest Rolls-Royce practice in the construction of liquid-cooled vee engines.

Large numbers of Napier Dagger 'H' shaped engines are in production, mainly for military use.

concern being early to realise the advantages of this layout, which to-day is becoming increasingly prominent. The Siddeley two-row "cats"—Jaguar, Serval, Panther and Tiger particularly—have been used for civil and military purposes all over the world, while such single-row models as the Lynx and Cheetah have given equally distinguished service.

The lustre given to the name of Napier since 1918 by the "broad-arrow" Lion is likely to be matched now that the company is in large-scale production with air-cooled units with four banks of cylinders arranged in the form of the letter "H." The newest Napier unit which it is permissible to mention is the E.108, a development of the Dagger series, giving considerably more power than the 805 h.p. of the Dagger III and supercharged to a higher altitude. The Napier Rapier is being fitted in Service and civil types.

Commercial and civil aviation might have been in a sorry state were it not for the foresight of the De Havilland concern in producing light air-cooled engines of up to 200 h.p. at a crucial period.

The Cirrus four-cylinder air-cooled models have, since 1925, been favourites among private owners, and the latest Major and Minor models seem destined for big things.

In the light, high-revving Pobjoy radials of recent years we have engines whose value is appreciated in many parts of the world, including America.

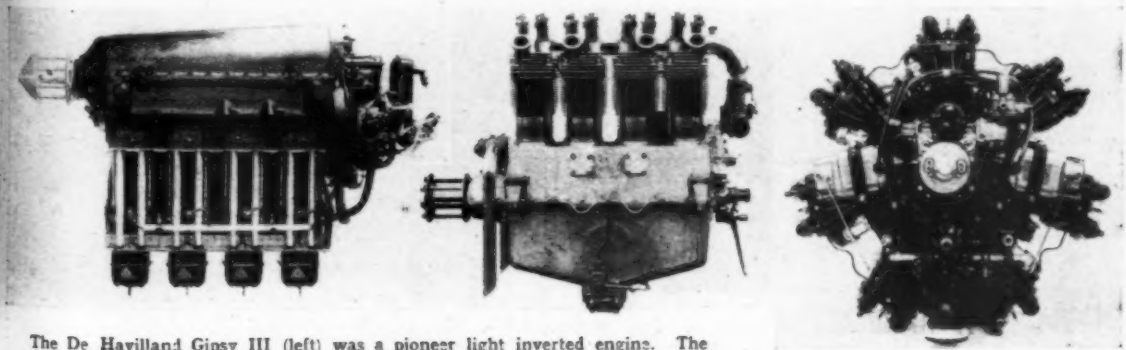
In answer to the demands of the "ultra-light" market a number of small power plants have appeared during the past year or two.

Beardmore-Halford-Pullinger and Rolls-Royce Falcon and Eagle. The names of Clerget, Sunbeam, Beardmore, Wolseley-Hispano, Bentley, Liberty and A.B.C. were by no means without glory during the war years.

The production of many of these war-time engines laid the foundations for our modern aero-engine industry which is able to offer more types of aircraft power plants than is any organisation abroad.

Bristol, Rolls-Royce, Armstrong Siddeley and Napier have been the chief suppliers of high-powered engines to the Service and for commercial use.

The Bristol nine-cylinder single-row radials descended from the Cosmos Jupiter and Mercury of the late war period. The output of the Jupiter rose steadily after 1919, largely as a result of increased crankshaft speeds, and in later years the engine appeared with reduction gearing and as a medium and fully supercharged model, eventually being replaced by the



The De Havilland Gipsy III (left) was a pioneer light inverted engine. The Cirrus I (centre) of 1925 vintage was a godsend to the budding "private owner" movement. Original in conception, the Pobjoy radial is here exemplified by the Niagara II.

HISTORICAL HIGH-LIGHTS

Some Notable Events, 1911-1937 : The Schneider Trophy Races : Outstanding British Speed and Altitude Records

NO review of the development which has taken place in aircraft design since 1911 would be complete without a reference to certain aircraft which, although neither civil nor military, represented very real progress or the beginning of entirely new ideas. Among the former should be classed the seaplanes produced for the long series of contests for the Jacques Schneider Seaplane Trophy, which brought seaplane design to a high pitch of refinement.

The first Schneider contest was held in 1913 and was won by the Frenchman Prevost at a speed of 45.75 m.p.h. In 1914 the trophy was secured for Great Britain by Mr. Howard Pixton, who flew a Sopwith seaplane with 100 h.p. Gnome *Monosoupape* rotary engine at a speed of 86.8 m.p.h. During the following contests Great Britain made little effort to defend the trophy, and not until Mr. Hubert Scott Paine, of the Supermarine Aviation Works, financed the building of a challenger did the trophy return to this country. Mr. H. C. Biard brought back the trophy in 1922, having flown his Supermarine Sea Lion (Napier Lion) at an average of 145.7 m.p.h. After that the biplane flying boat type became entirely outclassed by twin-float monoplanes, and for the 1927 contest, held at Venice, Supermarines produced the S.5 with boosted Napier Lion engine. On this machine Flt. Lt. S. N. Webster put up an average speed of 281 7 m.p.h. For the following contest, in 1929, the Supermarine Aviation Works produced the S.6, which was fitted with a Rolls-Royce racing engine of approximately 2,000 h p. F/O. H.R.D. Waghorn piloted this machine to victory at the astounding speed of 328.6 m.p.h. A few days afterwards, on the same machine, Sqn. Ldr. Orlebar established a world's speed record over the straight-line course in Southampton Water, his average being 355.8 m.p.h. On a subsequent attempt this figure became 357.7 m.p.h.

In 1931 there were no foreign challengers for the Schneider contest. The Supermarine S.6 had been slightly improved and Rolls-Royce had " found a few more horses " in the " R " engine, which by then developed about 2,300 b.h.p. Flt. Lt. Boothman flew the S.6B over the Schneider course at an average of 340 1 m.p h. Afterwards Flt. Lt. Stainforth established a world's speed record over the straight-line course by averaging 379 m.p.h. Subsequently, this was improved upon by fitting a specially boosted Rolls-Royce racing engine, and on September, 29, 1931, Stainforth, for the first time in history, exceeded 400 miles per hour, his corrected average speed over the straight-line course being 407.5 m.p.h.

* * *

The years 1931, 1932 and 1933 were outstanding in British aviation history. After the world's speed record followed two more worth-while world's records; those for altitude and distance. In September, 1932, Capt. Cyril Uwins, Bristol's chief test pilot, reached a height of 44,000ft. in a Vickers Vespa fitted with a Bristol supercharged Pegasus engine. In February of 1933 Sqn. Ldr. Gayford and Flt. Lt. Nicholetts flew from Cranwell, in Lincolnshire, to Walvis Bay, South Africa, a distance of 5,341 miles, in 57 hours 25 minutes.

Finally, in 1936, the world's altitude record was raised to 50,000ft. by Sqn. Ldr. Swain, who piloted a specially designed Bristol monoplane fitted with supercharged Bristol Pegasus.

* * *

One type of aircraft deserves a very special mention in this review as it " made history " in 1919. The Vickers Vimy, designed during the war as a bomber, was the first aircraft to make the flight across the Atlantic (crew, Alcock and Brown); it also made the first flight from England to Australia (Ross and Keith Smith), and the first flight from England to South Africa (Van Ryneveld and Brand). The machine was a biplane with two 360 h.p. Rolls-Royce Eagles.

* * *

For sheer efficiency few aeroplanes ever built have equalled the De Havilland Comet designed for the England-Australia Race. On one of these machines C. W. A. Scott and the late Tom Campbell Black flew from Mildenhall to Melbourne in a lapsed time of two days twenty-three hours. The new De Havilland Albatross may be said to be a four-engined scaled-up version of the Comet.

* * *

History was made in England in October, 1925, when Señor de la Cierva brought over the Autogiro and Capt Frank Courtney demonstrated it over Laffan's Plain, Farnborough, where, many years before, Cody carried out his experimental flying. That particular Autogiro was not the first, but it *was* the first to be seen in this country. It had an Avro 504 fuselage, a four-bladed rotor which was started by a long rope over a drum, and lateral control was by ailerons carried on outriggers. The performance was not startling, but the machine quite definitely flew and convinced many of the ultimate success of rotating-wing aircraft.

The Atlantic Race

AS is so often the case with major air contests, entries for the Atlantic Race were not received in any number until the eleventh hour. Within two days of the closing date—May 1—only a handful had reached the Aero Club de France, among them the three British nominations: Sir Hugo Cunliffe-Lister's Clyde Clipper (to be flown by an Olley Air Service pilot); a D.H. Comet entered and to be piloted by F/O. A. E. Clouston; and a Caudron in Miss Amy Johnson's name. At the last moment nineteen other entries poured in, as follows:—

Rumania.—Two: Prince Cantacuzine and Alex Papana.

Italy.—Nine: Bisea. Angelo, Cupini, Siori, Lippi, Garta, Rolandi, Ansini, and Suster.

United States.—Three: Joe Thorn, Dick Merrill, and James Mattern.

France.—Four: Three aeroplanes belonging to the Ministry for Air, and the fourth entered by the Société Transoceanique.

Sweden.—One: Linder.

Invitation from Cardiff

A SEALED-TIME arrival competition with some most handsome cash prizes—£50 first and £25 second and third—will, from the pilot's point of view, be the outstanding feature of the Cardiff Club's Coronation Air Rally, to be held, with the co-operation of the City Council, at Cardiff Airport on Whit-Saturday, May 15.

There are no entry fees, and all that the visiting pilot has to do is to land between 2.30 and 4.30 p.m. after circling the centre of the city at a height of not less than 2,000 ft. (if the ceiling is lower than 2,000 ft., the rule will not apply) and to report to the control officer immediately. There will also be a prize of £10 for the best-turned-out machine and one of £5 for the aeroplane with the greatest number of flying hours to its credit. An aerobatic display will entertain the public.

Coronation Co-ordination at Leicester

ALL the flying interests of the county of Leicester, through the recently formed Leicestershire Aeronautical Co-ordination Committee, are co-operating in the organisation of a Coronation Air Display, to take place at the airport, Leicester, on Thursday, May 13.

The afternoon programme (2.30-5 p.m.) will include a parade of aircraft, demonstrations, formation flying, aerobatics, model flying (including petrol models), and humorous events. The evening programme, commencing at 6.30 p.m., will be similar, but with the help of searchlights wielded by the 44th Leicestershire Regiment Anti-Aircraft Battalion R.E. (T.A.).

The organising committee has representatives of the Leicestershire Aero Club, Ltd., the County Flying Club, Desford Civil Flying Training School, Loughborough College (Aero Section), the Leicester and County Chamber of Commerce (Commercial Aviation Section), model aeroplane clubs, Mr. W. Lindsay Everard, Ratcliffe Aerodrome, and the Leicester Corporation Municipal Aerodrome Department.

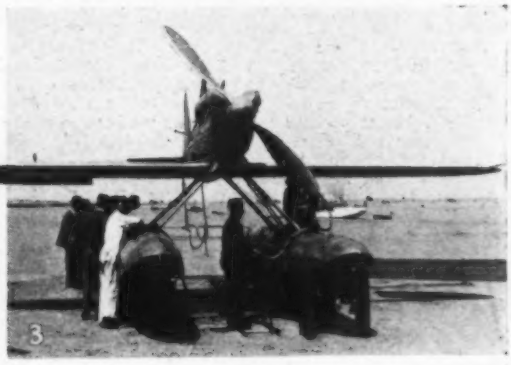
Publishers' Announcement

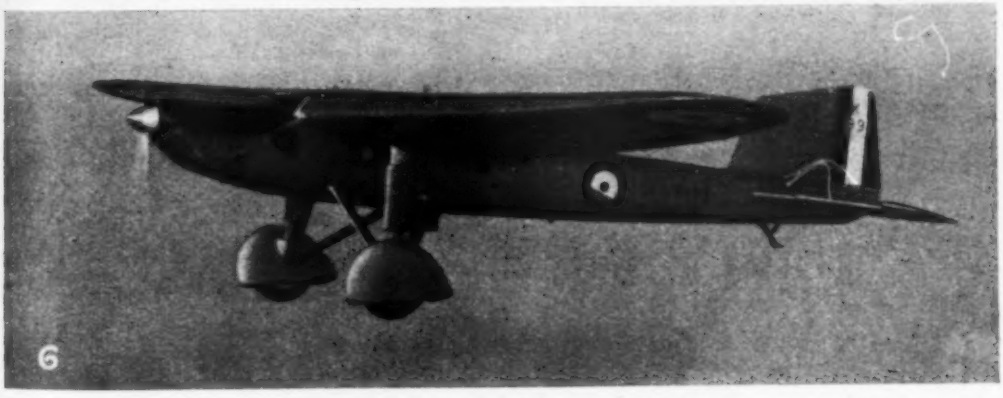
CORONATION HOLIDAY

MISCELLANEOUS Advertisements intended for the issue of May 13 must be in our hands by first post on Monday, May 10.

FLIGHT PUBLISHING CO. LTD.

SOME TYPES WHICH MADE HISTORY

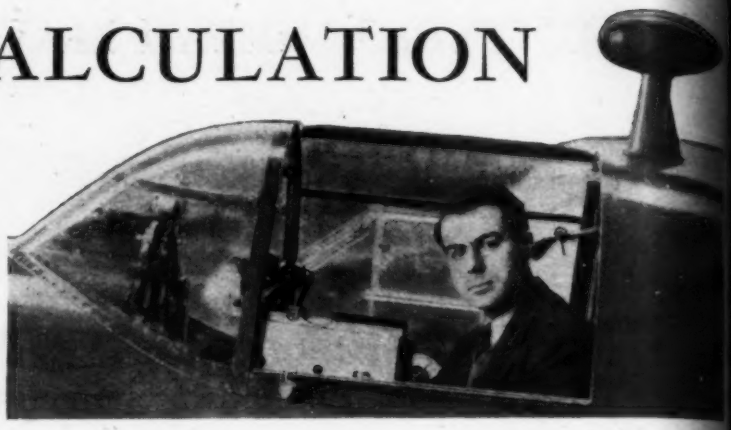




(1) The Vickers Vimy with Rolls-Royce Eagle engines was the first aeroplane type to cross the Atlantic, to fly from England to S. Africa, and from England to Australia. All these flights were made in 1919. The Supermarine Sea Lion (2) won the Schneider contest in 1922, and (3) the Supermarine S.6B won it in 1931. The Bristol 138 (4) reached 50,000 ft. in 1936. The first Autogiro (5) was flown in England in 1925, and the Fairey monoplane (6) flew non-stop from Cranwell to Walvis Bay in 1933.

COOL CALCULATION

Record-attempting with Flowmeter and Slide Rule : Comprehensive Equipment of Prince Cantacuzene's Caudron



Prince Cantacuzene at the controls, with the faired-in homing loop above.

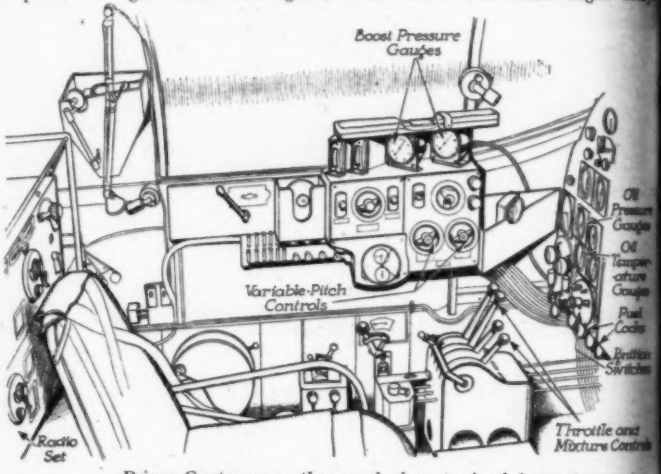
NEXT to the experimental hangar at Hatfield Aerodrome was housed last week a Caudron Typhon—quite a normal single-seater Typhon from external appearance, but on examination of the cockpit the immense array of unusual instruments found on both sides, above, below and behind the pilot's seat, immediately set one thinking. Among this equipment was to be seen oxygen apparatus with four 900-litre bottles at 150 atmospheres pressure and an automatic valve to vary the supply according to altitude. The machine was apparently to be used at high-altitude work, so perhaps in their standard cowlings the two engines were not quite standard? Several fuel taps and gauges, together with boost indicators, seemed to point to more than just additional tanks and on making enquiries it was discovered that 87-octane Shell fuel was to be used for cruising and 100-octane for the take-off.

The two inverted six-cylinder air-cooled Renault engines were specially supercharged for an altitude of 4,200 metres (12,800 ft.), and the power figures were 300 h.p. for take-off at 2,625 r.p.m. with 150 mm. boost pressure and for maximum continuous output 240 h.p. at 2,500 r.p.m. These figures gave a cruising speed of a little over 200 m.p.h. and a maximum speed of about 237 miles per hour at 2,300 r.p.m. At the most economic engine speed the range of this Typhon was approximately 8,000 metres (5,000 miles).

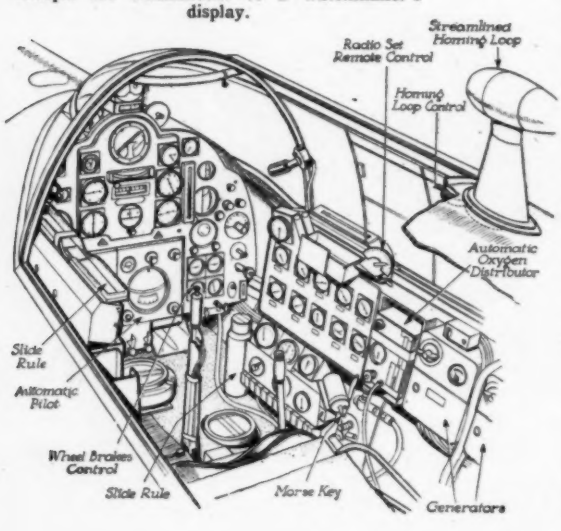
At the nearby Comet Roadhouse, Prince Cantacuzene of Roumania slept each afternoon in anticipation of an early start on an attempt to reach the Cape in the startling time of 29 hours. It was the pilot's intention to make the flight with only three stops, at least one of which meant a full-load (about 10,100 lb.) take-off in darkness.

The Prince, who holds the Paris to Bucarest record of 5 hr. 40 min., had the smallest detail of this flight planned to the minute before leaving. He proudly described special points of his equipment, the oxygen apparatus, the automatic pilot, the Standard Telephones' new-type homing device and the petrol flowmeters which, with the help of a slide rule, enable consumption to be checked at any time.

The Caudron took off from Hatfield on Saturday and made good time to Algiers, where there was some slight delay.



(Right and below) Interiors of the Typhon cockpit are reminiscent of a watchmaker's display.



Prince Cantacuzene then pushed on to Aoulef, on the southern edge of the Sahara, but, taking off with a fuel load of 600 gallons, he was unlucky enough to puncture a tyre, which caused further delay. At the time of writing it is not certain whether he has given up the attempt.

None of these mishaps detract from the unusual interest which the Caudron's equipment presents.

H. F. Broadbent's Success

MEANWHILE, as we go to press, we learn of the successful completion of a fine effort by an Australian pilot of a British machine. At 6.40 p.m. on Monday evening Mr. H. F. Broadbent put down his Leopard Moth at Lympne after having flown from Australia (Darwin) in 6 days 10 hours 55 minutes. He had thus shortened by 1 day 8 hours 55 minutes the previous figure of 7 days 19 hours 50 minutes set up by Mr. H. L. Brook in 1935.

At the same time Mr. Brook was making good time Londonwards from the Cape in his Percival Gull, and was nearing Cairo on Monday evening.

A third record-breaker, F/O. Llewellyn, was waiting to take off for the Cape in a Vega Gull on Tuesday morning.

We hope to say more about all these attempts next week.

MODELS

Owing to the extreme pressure on space caused by the special Coronation review features in this issue, *Flight's* monthly Aircraft Models Page is held over until next week.